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ARCHEOLOGY OF THE EASTERN POWDER RIVER BASIN, WYOMING

Prepared for

The Bureau of Land Management
Contract Number YA-512-RFP6-104

May 21, 1977

Edited by George M. Zeimens and
Danny N. Walker

with contributions by

George M. Zeimens
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Amoco Oil Production Company
Apache Corporation
Atlantic Richfield Company
Banta and Haigh
Belle Fourche Pipeline Company
Brownlie, Wallace, Armstrong and Bander
Burlington Northern Railroad
Buttes Resources
Carter Mining Company
Champlin Petroleum Company
Cities Service Company, Energy Resources Group

Davis Oil Company
Diamond Shamrock
Gary Operating Company
Guld Oil Company
Havoco, Inc.
Hayne and Meyer
Jerry Chambers Oil Producer
Kerr-McGee Coal Corporation
Kerr-McGee Nuclear Corporation
Kirkwood Oil and Gas Company
McAlester Fuel Company
Pacific Power and Light Company
Peabody Coal Company
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Petroleum Supervisor and Management, Inc.
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Tri-County Electric Association, Inc.
True Oil Company
Union Carbide Corporation
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Woods Petroleum Company
Wyodak Resources Development Corporation
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Yates Drilling Company

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CHAPTER I
INTRODUCTION

George M. Zeimens

Purpose of the Project:

With the advent of the energy crisis a few years ago and the need to quickly develop the rich energy-related mineral resources (coal, oil, gas, uranium) in the Powder River Basin, there also arose a need for an orderly system for development of those resources. In the past, mineral exploration and development has caused untold damage to the natural environment. Other resources, land, water, air, etc., have suffered greatly from the development of the more economically profitable mineral resources. One resource that has suffered severely is the archeological record. Archeological sites, like mineral resources, are non-renewable. Once a site has been damaged or destroyed, the scientific data it contained is lost forever.

In recent years there has been a shift in the philosophy of the archeological community from an orientation of exploitation of cultural resources to a new trend toward preservation and conservation (for example see Lipe 1974). This change in philosophy has influenced federal agencies who are charged with the administration of resources on federal lands. Efforts are now being made to identify, manage, and develop archeological resources in much the same way that other resources are managed. Recent federal legislation and regulations (Executive Order Number 11593 and the Moss-Bennett Bill (P.L. 93-291) among others) have reinforced and clarified some of the older and rather nebulous antiquities laws. Now, before the terrain of any area can be disturbed as a result of a federal action, adequate consideration must be given to any cultural resources that may be affected. This often involves privately owned lands when federal permits are required to develop federally owned minerals.

Federal agencies, in this case the Bureau of Land Management, are desperately trying to assess what impact mineral development will have on the natural environment before issuing permits. This is a unique development in the sense that in the past there was virtually no attempt made to control the affect of industrial impact on cultural resources. This report is the result of efforts of the Bureau of Land Management to assess the impact of coal mining on archeological resources in the Powder River Basin (Figure 1). The Bureau of Land Management contracted with the Wyoming State Archeologist's Office (Request No. YA-512-RFP6-104) to prepare a synopsis of what is known about the archeology of the Eastern Powder River Basin, and to predict what resources may be encountered in

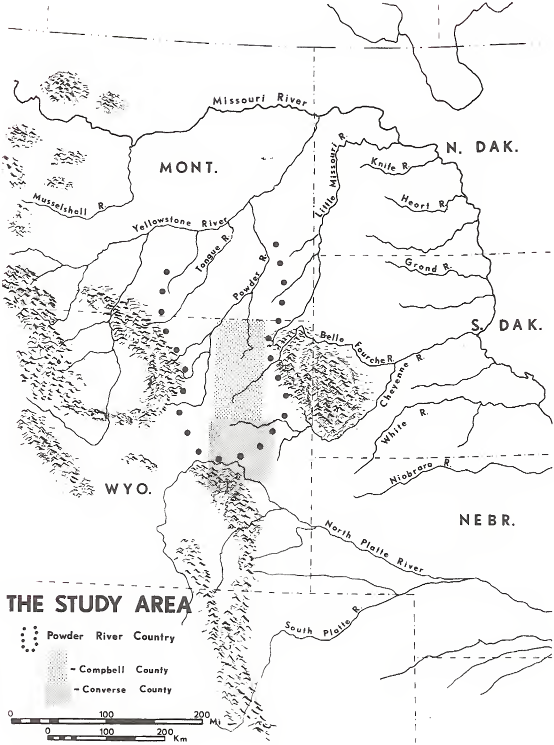
Missouri River
MONT.
N. DAK.
Musselshell R.
Yellowstone River
Tongue R.
Powder R.
Little Missouri R.
Knife R.
Heart R.
Grand R.
S. DAK.
Belle Fourche R.
Cheyenne R.
White R.
Niobrara R.
WYO.
NEBR.
North Platte River
South Platte R.
THE STUDY AREA
Powder River Country
- Campbell County
- Converse County
0
100
200
Mi
0
100
200
Km

Figure 1

the area. The purpose of this report then, is to prepare such a compendium, and to attempt to construct a usuable predictive model. The predictive model is simply an effort to determine what kinds of sites potentially exist and where they may be located. If such a model is possible, then the federal regulatory agencies would have a better basis for managing both known and potential archeological resources by advising and controlling those involved in the management and development of minerals or other resources. The desired result is that one resource can be fully developed with minimal affect to another resource.

History of Archeology in the Area

Concerning the archeology of this area, Waldo Wedel stated almost thirty years ago:

> "Unfortunately, despite very promising clues from surveys in the area, there has been relatively little systematic excavation on a scale commesurate which the problems involved." (Wedel 1949: 330).

Unfortunately, that statement still accurately reflects the situation today. Until about 1973 there had been almost no systematic professional archeological studies conducted directly on the lands in question. A small surface reconnaissance was conducted in 1949 and 1950 by the River Basin Survey under the auspices of the Smithsonian Institution, for the Moorhead Reservoir located in the extreme northwestern portion of the area (Wheeler 1949). However, that study did not result in archeological investigations of any consequence. River Basin Survey personnel were hampered by several factors. First, they did not have adequate time to work ahead of rising waters. In many cases time was not allowed for thorough investigations which resulted in the innundation of many sites. They often lacked sufficient funding. Perhaps most critical for Wyoming was the fact that they lacked personnel familiar with the archeology of the area and who had no fundamental knowledge of local resources as a basis from which to operate.

Excavations at two buffalo kills in 1969, one near Glenrock in the extreme southwestern portion of the study area and another near Pumpkin Buttes provided the only fully documented sites from the area to date (Frison 1970: 1-66 and 1971:77-91). In order to learn anything of the prehistory of the lands involved, one must extrapolate from the literature concerning the surrounding area.

Since 1973 many surveys have been conducted for various coal and uranium mines, well drilling locations, transmission lines, roads, etc. Minor excavations have been conducted on some of those projects, but so far only preliminary reports have been produced. This report will attempt to compile all the data from the relatively small survey projects and put it together to construct a broader picture of the prehistory of the Powder River Basin.

Throughout the history of Northwestern Plains archeology, the interior basins have been neglected. This neglect has not been due to oversight on the part of the archeologists. Funding has always been extremely limited for archeological endeavors, and investigators were forced to concentrate their efforts on certain types of sites. They had to select sites that would yield large quantities of the more exotic and diagnostic artifacts such as projectile points, beautifully flaked bifaces, and butchered bone. These kinds of sites are usually hunting camps or kill features and tend to be located in the mountains and foothills, or at least they are more visible in those areas. Thus, the interior basins have been neglected until very recently. This has resulted in a large gap in the archeological record.

Small sites have also been neglected in the past. They tend to be less significant in that they contain lesser amounts of data, but they do contain meaningful information which can be systematically collected (Talmage and Chester 1977). In fact, the smaller sites begin to take on more significance when one begins to think in terms of settlement patterns, demography, seasonal economic adaptation, etc. Any small sites that potentially contain those kinds of data are also valuable to the interpretation of the larger sites. Fire pits, for example, are probably the most common archeological feature in Wyoming. They seem to be concentrated in, but are not confined to, the interior basins. It has been hypothesized that pits represent seasonal vegetable food procurement activities. Yet, so little is known about their spatial or temporal distribution, or their construction and function. As common as they are, it is difficult to believe that so little has been done to ascertain their significance in the archeological record.

Project Goals:

As stated earlier, the main goal of this project is to construct a useable predictive model, but it is hoped that several other objectives will be achieved as well. What is known of the archeological record will be brought up to date. Several small surveys and small excavations will be documented here for the first time. Hopefully it will result in a better understanding of the potential resource base for all those involved in the area now, as well as those who must make evaluations and decisions about industrial and cultural resources. It is also hoped that it will produce valid recommendations for and stimulate more systematic research in the area in the future.

Project Design:

Since so little systematic research has been conducted in the area, a major portion of time will be alloted for dealing with basics; i.e.; what is the natural environment, what archeological problems are involved, and what resource base exists for dealing with those problems? The first logical step is a thorough literature search. All references to past archeological work and ethnographic literature will be reviewed. References to archeology in and near the area will provide some knowledge of the prehistoric archeological record. Ethnographic references should provide some insight to cultural use of the area, at least by historic tribes. Amateurs and collectors were contacted concerning their knowledge of the area. With a certain amount of knowledge at hand, it will be possible to construct a preliminary cultural chronology. With a good basic understanding of the natural environment, ethnohistory, a temporal framework, and some knowledge of the regional problems, it should be possible to make some valid interpretations. A good basis should be obtained from which to make reliable evaluations of the potential for specific archeological resources to contribute to the archeological record.

The next step will be to describe the known archeological resources. Descriptions will be brief in some cases and more elaborate in others, depending on how much is known about each site. Exact legal locations will not be provided in this report. Those involved in research and needing locational information can contact the State Archeologist in Laramie or the Bureau of Land Management District Office in Casper. Approximate locations will be plotted on areal maps.

Limitations of the Project:

Most of what is known about the area is based on archeological surveys. Survey is a sampling process by which specific parcels of land are inventoried for archeological resources. There are several inherent problems with surveys and sampling which should be mentioned here. The first problem deals with sampling design. The actual design to be used should depend on the area to be surveyed and on the kind of information the investigators want to collect. No large-scale survey has ever been designed or tested for this specific area. Sample size is an important consideration. There is no general agreement on what constitutes a valid sample. Estimates of sample size needed run from 10% to 100% (Read 1975:51), and seem to depend on the ecological zone, the kinds of sites involved, the amount of past work in an area, and so on. A sample can be considered to be adequate if it contributes significantly to the solutions of archeological problems such as: chronology, behavioral reconstruction, social organization, settlement patterns, etc. (Mueller 1975).

In order to make a meaningful contribution the sample must be stratified, i.e., a portion of each ecological zone in the area must be included. The underlying assumption is that the location of archeological sites is dependent upon vegetation which is linked closely to prehistoric economic strategies. Most of the surveys conducted in the Powder River Basin have been confined to the low-lying open areas where coal deposits are shallow. Areas such as the pine ridges and other zones have been excluded. This means that the archeological sample from the Powder River Basin is still not adequate. One of the most frustrating problems with surveys is that, at least for compliance studies, the investigators must confine their work within certain boundaries. Industry or government agencies balk at paying for work outside their particular project areas. They are not really concerned about learning about the dynamics of cultural development. Their needs are only to identify archeological resources that may be affected by a particular project, and to mitigate affects on those specific resources. The relationship between those and other resources may be of some interest to them but they cannot justify paying for indirect studies. The investigator ends up with a small non-stratified, nonrandom sample with which to interpret the archeology of an area.

One major problem lies in the fact that it is impossible to determine exactly what size of sample has been obtained on any survey. When 100% of an area has been covered thoroughly, that does not mean that 100% of the archeological resources have been identified. Sites are often buried and not visible on the surface. Sites or artifacts can be hidden by vegetation. Many sites visible on the surface have been collected heavily by amateurs which can drastically alter interpretations of their spatial and temporal limits. Many sites have been destroyed by erosion or other causes and what is left is, in itself, some unknown fraction of the archeological record.

The sample is also affected by the limitations of the investigator. Often an archeologist will be called upon to inventory and evaluate an area in which he has no expertise. For example, one who has spent all his time and training dealing with Historic sites in the Southwestern United States may acquire a contract on lands in the Pacific Northwest or the Northwestern Plains. Although he may possess a high level of formal education, it would take him several months to acquire the necessary expertise to do a competent job. It is also necessary to be familiar with local ecology, for interpretations of any archeological site will depend greatly on how well the natural environment of the site is understood, i.e. vegetation, topography, stratigraphy, etc. He fulfills his brief committment and moves on. Without a long-term committment to the area, his study and recommendations can only contain a limited amount of validity.

Another limiting factor is error. Maps can be misread, areas can be overlooked, dedicated individuals may go to work too early or stay too late and try to see when light is poor. Mistakes can be made in recording, notes or artifacts may be lost or materials may be misidentified. Error can be minimized by using more experienced crews. The longer an agency or institution is involved in an area, and the more familiarity their personnel acquire for an area, the more reliable their data will be.

There are several positive aspects of sampling. First, it must be remembered that no matter how well an area is covered, all that can be obtained is a sample of what originally was contained in the archeological record. Whether excavating a large site or conducting a regional survey, the archeologist will always be dealing with only a sample of prehistoric activities. Sampling is an economical way of getting a foothold on a large area. Even when a sample is not large enough to provide a basis for understanding past cultural complexities of an area, it can at least provide substantial information about what resources are potentially contained in an area. Extensive 100% surveys on lands to be modified by industrial development are essential for locating resources that will be affected. But if those resources are to contribute to an understanding of the prehistory of the area, studies need to be tempered with random stratified samples of adjacent areas and excavations at key sites. Eventually the regional sample will be large enough to construct reliable predictive models.

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CHAPTER II
NATURAL ENVIRONMENT AND CULTURAL ECOLOGY

Charles Reher, Danny Walker, Sandra Todd

Topography and Drainage

The Powder River Basin is one of a series of structural basins found in the unglaciated Missouri Plateau section of the Great Plains Physiographic Province (Woodward-Envicon 1974:3-1, Thornbury 1965). The basin is bounded by the Casper Arch to the south, the Laramie Range on the west and south, the Big Horn Mountains to the west, the Black Hills and Hartville Uplift to the east and the Missouri Breaks to the north.

Generally, the topography of the Powder River Basin consists of low rolling hills. The relief is relatively subdued because surface material consist primarily of soft clay shales which have not been deeply eroded. Where erosion has cut into one of the lenticular sands or baked clays of the Eocene Wasatch formation, relief is sharper (Woodward-Envicon 1974:3-1). Elevations range from around 6000 feet along the Pine Ridge Escarpment in the western portion of the basin to around 3000 feet along the eastern border. Locally, there may be as much as 250 to 500 feet of relief above stream channels.

A topographic feature known as Pumpkin Buttes marks the divide between the four major rivers draining the Powder River Basin. The Powder River heads in the southern Big Horn Mountains and flows north to the Yellowstone River in south-central Montana. The Tongue River heads in the northern Big Horns and parallels the Powder River. The Cheyenne River heads in the central portion of the basin, skirts the southern end of the Black Hills and flows northeastward. The Belle Fourche also heads in the central basin area and flows around the west side of the Black Hills to join the Cheyenne east of the Black Hills. The North Platte River flows along the southern border of the study area. Each of these rivers, of course, have numerous tributaries. These tributaries form the major drainage pattern for the basin and provided, as they do to the present inhabitants today, a constant water source for the prehistoric inhabitants.

Pre-Quaternary Geology

The sedimentary strata exposed in the Powder River Basin span the Cenozoic Era (Woodward-Envicon 1974:3-14 to 3-18). These strata were mostly derived from the Laramie Uplift and deposited in the large subsiding trough of a structural basin. Along the western edge of the basin, Precambrian crystalline rocks and other overlying Pre-Cenozoic rocks plunge steeply to the east (Figure 2).

Subsidence of the Powder River Basin was not continuous, nor did sedimentation occur at a constant rate. The sands and silts comprising the oldest of the sediments were deposited during the Paleocene Epoch (60 to 70 million years ago), and suggest a paleo-environment of low-lying land with relatively slow, meandering streams carrying sediments basinward from the adjacent highlands. The presence of coal and more fine-grained sediments in the upper part of the formation suggests that erosion of the highlands lessened, during the latter part of the Paleocene Epoch. This in turn created a swampy, poorly drained environment which was densely forested (Woodward-Envicon 1974:3-17).

Near the close of the Paleocene Epoch, an acceleration occurred in either the rate of subsidence of the basin or the rate of uplift of the adjacent highlands, or both. This tectonic change is reflected in some locations by an erosional discontinuity, or unconformity, between the Fort Union Formation and the overlying Wasatch Formation, which was deposited during the Eocene Epoch (40 to 60 million years ago). Thin beds of decaying vegetation, in time metamorphosed to coal, were laid down in backwater areas, while thick clastic sediments were deposited toward the center of the basin, becoming more fine-grained as distance from

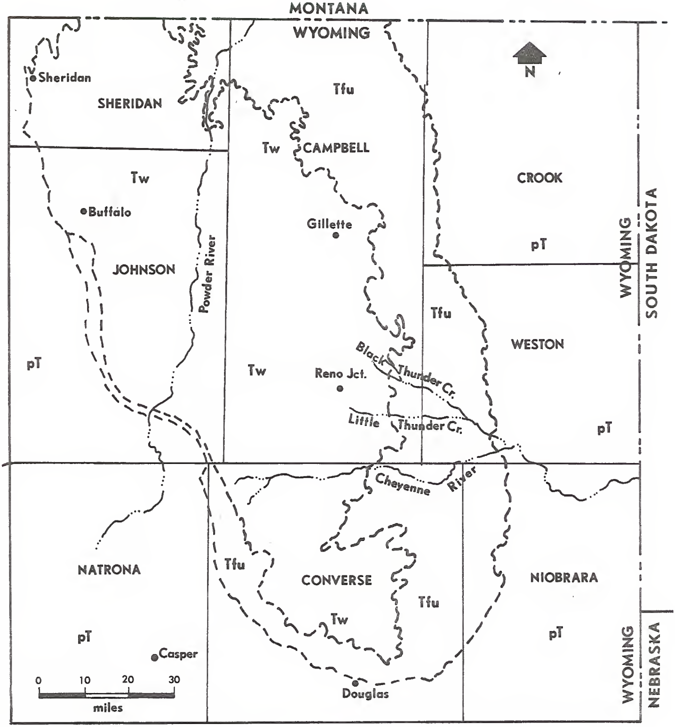

Figure 2 SIMPLIFIED GEOLOGIC MAP - POWDER RIVER BASIN

Source: Woodward-Envicon 1974: Fig. 3.1-4

LEGEND

SIMPLIFIED GEOLOGIC MAP
POWDER RIVER BASIN
Figure 2

Tw	Eocene Wasatch Formation
Tfu	Paleocene Fort Union Formation
pT	Pre-Tertiary Rocks

Source: Woodward-Envicon 1974: Figure 3.1-4 the source areas of the highlands increased. The Wasatch Formation can be zoned into several facies on the basis of these differing lithologies (Woodward-Envicon 1974: 3-17).

In the northern part of the Powder River Basin, there is a barely discernible break in lithology between the Fort Union Formation and the overlying sediments of the Wasatch Formation. To the south, however, the clayey, coal-rich sediments of the upper member of the Fort Union Formation contrast with coarser materials comprising the Wasatch. The clastic constituents of the Wasatch Formation become increasingly coarse further to the south, indicating that direction as the source of sedimentation. The mineralogy and orientation of bedding in the Wasatch Formation further supports this conclusion, pointing to the Laramie Range as the source of material (Woodward-Envicon 1974: 3-18).

Another break in the sedimentary record occurred at the end of the Wasatch deposition. Sediments of Oligocene age (25 to 40 million years ago) unconformably overlie the Wasatch in isolated locations in the Powder River Basin; but over most of the basin, these rocks have been completely removed by erosion (Woodward-Envicon 1974:3-18). Rocks of Miocene and Pliocene age are largely absent in the Powder River Basin, although excellent examples may be found elsewhere in Wyoming (Love 1970).

Quaternary Geology and Soils

Within the Powder River Basin today, large flat upland areas remain as remnants of a late Tertiary land surface. This plain is dissected by broad, gently sloped valleys in which present-day streams occupy channels 200 to 300 feet below the ancient erosional surface. As many of the flood plains of these valleys are broad, their streams apparently were larger in the geologic past and possessed a greater erosional capacity than the modern ephemeral streams. Unconsolidated deposits of fill (up to 40 or 50 feet in certain areas) in the valley beneath the flood plains suggest that the strength of the streams has risen and fallen intermittently in the recent geologic past (Woodward-Envicon 1974:3-18). This fill has preserved numerous archeological sites but also presents the problem of site visibility.

The soils of the Powder River Basin are typical, semiarid grassland soils found throughout the Western United States. Organic material is slow to accumulate due to the climate and vegetative conditions. The soils are residual in nature (ie: developed in place) and most were formed from weathered sandstone and shale bedrock materials. Alluvial soils are also present and are developed along stream bottoms from material derived from highland areas and deposited along the streams. These alluvial soils usually contain a fair amount of organic matter (Atlantic 1976a:14).

Climate

The climate of the shortgrass plains has been discussed in detail elsewhere (Borchert 1950, 1971; Coupland 1958; Trewartha 1961; Collins 1969; Reeves 1973), so only a few points need to be made here. Overall the region is semi-arid. Rainfall typically increases through spring and drops off sharply during the summer. The overall low precipitation is the result of domination of summer and winter by the dry Mild Pacific air mass. Precipitation that does occur is usually the result of intrusions of Arctic or Tropical Maritime air. The steep rainfall gradient associated with the summer mean frontal position of the Mild Pacific air mass marks the boundary between the shortgrass area and the taller grasses of the eastern prairies. The relatively marginal effective moisture which is characteristic of the western plains is thus the chief determinant of the shortgrass vegetation.

This portion of the North American grassland biome also has the most variable climate in the world. Flora and fauna must be adapted to extreme seasonal variation, and the variation from year to year is often drastic. Large droughts have characteristically affected the Great Plains about every 20 years since climatic records have been kept. These extend truly arid conditions along the western plains and semiarid conditions east into the prairie. The most severe droughts seem to effect every fourth or fifth decade, that is, every other drought.

There are also moisture fluctuations towards the positive side, although these have not been subjected to the same intensive study as historic droughts. One of the better known of these is a series of moist periods in the 17th and 18th centuries which have been recognized collectively as the Little Ice Age. This episode, of approximately 200 years duration, has been monitored, with varying detail in neoglacial activity (Richmond 1965:227; Porter and Denton 1967; Brekenridge 1974), in applications of the Blytt-Sernander chronology to North American (Baerreis and Bryson 1965:217), and by varying concentrations of oxygen isotopes in cores of the Greenland ice cap (Dansgaard _et al_.1970).

These studies document a hemisphere-wide trend towards cooler, moister climate. Studies of varved sediments (dating from about A.D.1500-1650) in the Vore site, a buffalo jump in the Wyoming Black Hills is more directly related to the Powder River Basin (Reher and Frison in press) (Figure 3). These varves show a series of significant peaks in moisture, and when subjected to time series analysis (e.g. Anderson 1961; Koopmans 1974) a significant 10 year period is observed. Cumulative soil moisture and related phenomena would tend to carry grass production over the few truly dry years. During the initial part of the Little Ice Age in the northern Black Hills, the 20 year drought cycle was apparently offset by moist periods of greater frequency, and perhaps of greater amplitude. Tree-ring analysis now in progress (Reher n.d.c), will allow exact cross-dating of the Vore varved strata, and eventually a better understanding of climate in the Black Hills and Powder River Basin.

As well as variation on a "first-order" and "second-order" scale (annual-decennial and one to several centuries duration), climatic variations on a "third-order" scale existed (one to several thousand years) and must be considered. An example is the 2000 year period of generally deficient moisture known as the "Altithermal", which lasted roughly from 7000-5000 BP.

The Powder River Basin as a whole can be characterized as semi-arid in climate. Annual precipitation ranges from 12 to 15 inches, most of which falls in spring and summer (Becker and Alyea 1964). Temperature is characterized by

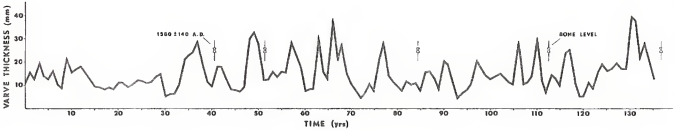

FIGURE 3: Wet-dry climatic peaks as revealed by varved sediments at the Vore Buffalo Kill in the Black Hills of Wyoming

extremes, both daily and seasonally, and can range from 110°F to -40°F during the year. Snowfall averages around 40 to 50 inches a year, and the high winds often accompaning snowfall cause the extreme blizzard conditions well known for the Plains. Periods of arctic conditions when temperatures remain well below zero for one or two weeks are common. Effects of some of these climatic trends on cultural ecology is discussed below.

Vegetation

The Powder River Basin can be characterized as a vast grasslands area, despite large expanses of sagebrush (Figure 4). There are a total of six broad vegetative zones present: grasslands, shrublands, riparian, pine covered ridges and breaks, sandhills grasslands, and clay slope/alkali badlands. It is often difficult to delineate the boundary between grasslands and shrublands. For this report, grassland is defined as areas with less than 50% sage cover. Shrubland is defined as areas of greater than 50% sage cover.

Both precipitation and soil types have a strong effect on the character of the vegetation. Although the climate of the basin is basically similar throughout, the area to the north generally receives a greater amount of rainfall. Also, locally higher areas such as the Pumpkin

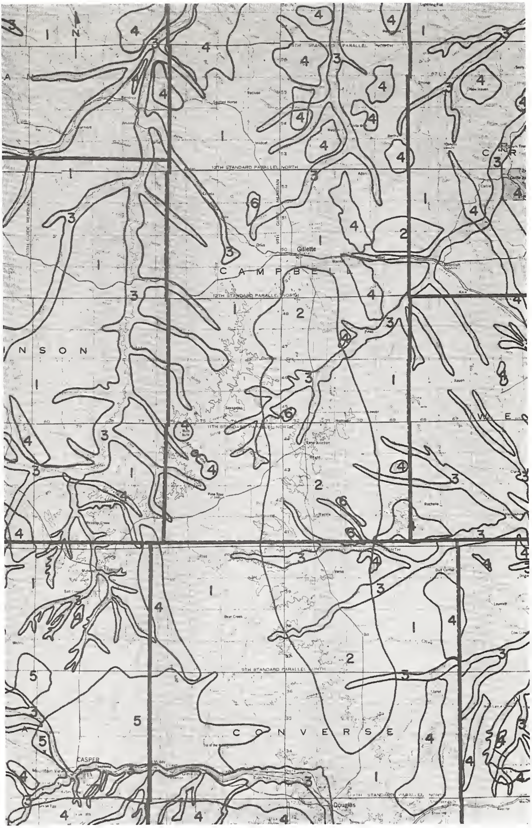
CAMPBELL
CONVERSE
Gillette
CASPER
Douglas
12TH STANDARD PARALLEL NORTH
11TH STANDARD PARALLEL NORTH
9TH STANDARD PARALLEL NORTH
1
2
3
4
5
6

FIGURE 4: Generalized vegetation map, Powder River Basin, Wyoming

LEGEND

MAJOR VEGETATION ZONES
POWDER RIVER BASIN
Figure 4

1	Grassland Zone
2	Shrubland Zone
3	Riparian Zone
4	Pine Covered Ridges and Breaks
5	Sandhills Grassland Zone
6	Clay Slope/Alkalai Badland Zone

Scale

Buttes or the Rochelle Hills will receive a greater amount of precipitation. Soil types (i.e.: sandy, clayey, loam) can also provide a dramatic change in vegetation within a short distance.

Vegetation zones in the study area, based on dominant vegetation, were mapped using U-2 color infrared photography made available through the courtesy of the University of Wyoming Remote Sensing Laboratory (Ron Marrs, Supervisor). The zones boundaries can be seen easily in these photographs and were plotted on a map of the Powder River Basin (Figure 4). Of particular interest to this study are the areas where the zone boundaries meet and overlap.

Hunters and gatherers of the Northwest Plains used large numbers of both plant and animal species in order to exist. It can be assumed that these people would exploit site settings which would enable them to maximize the numbers of species they could collect (Reher 1977) (see below). This map shows numerous ecotonal areas and if the assumption is true, these areas should contain numerous archeological sites.

Grassland Zone:

The entire basin could be classified as a grassland despite large areas of shrub. By far the most common species is blue grama (*Bouteloua gracilis*), although in some areas it is challenged by western wheatgrass (*Agropyron smithii*). Some secondary species are: threadleaf sedge (*Carex filifolia*), prairie junegrass (*Koeleria cristata*), needleandthread grass (*Stipa comata*), (Atlantic 1976a:119), bluebunch wheatgrass (*Agropyron spicatum*), and slender spikerush (*Eleocharis acicularis*), (Bureau of Land Management *et al*.1974:369). In areas of rougher terrain and coarser soils (Atlantic 1976b:Appendix IX:24), little bluestem (*Andropogon scoparius*), prairie sandreed (*Calamovilfa longifolia*), sand dropseed (*Sporobolus cryptandrus*), red threeawn (*Aristida longisteta*), or Indian ricegrass (*Oryzopsis hymenoides*), (Atlantic 1976c:123), may occur. Minor species include stoneyhills muhly (*Muhlenbergia cuspidata*), hairy grama (*Bouteloua hirsuta*), and sideoats grama (*B. curtipendula*). There are a few forbes present such as globmallow (*Sphaeralcea* spp.) lupine (*Lupinus* spp.), and licorice (*Glycyrrhiza* spp.) (Bureau of Land Management *et al*.1974:271). Small soapweed (*Yucca glauca*), and plains prickly pear (*Opuntia polycantha*) may be locally abundant. It must not be forgotten that many areas shown as grassland have up to 49% sagebrush, mostly big sage (*Artemisia tridentata*), but also silver sage (*A. cana*) in sandy areas.

Shrubland Zone:

The shrub present here is almost exclusively big sage (Artemisia tridentata), except in sandy areas as mentioned above. The major understory is blue grama (Bouteloua gracilis) (Atlantic 1976a:124). In clay soils western wheat grass (Agropyron smithii) will be present, while in sandy or rapidly drying soils needleandthread grass (Stipa comata) seems more common (Bureau of Land Management et al. 1974:272). Secondary grasses and sedges include sandberg bluegrass (Poa secunda), prairie junegrass (Koeleria cristata), and threadleaf sedge (Carex filifolia). Lesser grasses include Indian ricegrass (Oryzopsis hymenoides), green needlegrass (Stipa viridula), bluebunch wheatgrass (Agropyron spicatum), and cheatgrass (Bromus tectcrum). Plains pricklypear (Bureau of Land Management et al. 1974:272-273) is widely distributed throughout the community.

Riparian Zone:

This zone is delinated as far as possible on the accompanying map. The presence of cottonwoods was the prime determinent for mapping purposes, but it should be kept in mind that the lush bottomland grasses, without cottonwoods, will extend up the small intermittent drainages as shown on the map (Figure 4). The presence of cottonwood signals a definite streamside community even if water is not flowing on the surface for most of the year. Three species gorw in the Basin: Plains cottonwood (Populus sargenti), narrow leafed cottonwood (P. angustifolia) and the lance leafed cottonwood (P. acuminata). Under the cottonwoods, rocky mountain juniper (Juniperus scocpulorum) may grow. Another more infrequent member of the community is the box-elder (Acer negundo).

Also along the stream channel grow willows such as the peach leafed willow (Salix amygdalcides), sandbar willow (S. interior), and coyote willow (S. exigua). The understory can be quite dense and complex containing such species as wild rose (Rosa spp.) (Bureau of Land Management et al.1974:277), chokecherry (Prunus virginiana), sand cherry (Prunus pumila), bearberry (Arctostaphylos uva-ursi), currents (Ribes spp.), and other fruiting trees and bushes.

Stream channel grasses tend to be taller and more lush than those on the surrounding hills. They include prairie cordgrass (Spartina pectinata), tufted hairgrass (Deschampsia caespitosia), basin wildrye (Elymus cinereus) and canada wildrye (E. canadensis) slender wheatgrass (Agropyron trachycaulum), (Atlantic 1976a:126), bearded wheatgrass (A. caninum), western wheatgrass (A. smithii), inland sedge (Carex interior), and mat muhly (Muhlenbergia richardsonis). Some forbes present are licorice (Glycyrrhiza spp.), aster (Aster spp.), golden pea (Thermopsis spp.), starwart (Stellaria spp.), virginsbower (Clematis spp.) and yarrow (Achillea spp.) (Bureau of Land Management et al. 1974:270).

Pine Ridge Zone:

Pine grows in many places throughout the Basin. It must be remembered, however, the areas containing pine are not dense tracts of forest. In most cases, the trees will be scattered on the ridgetops only, with the sloping hillsides being covered with juniper and grass or sagebrush. Ponderosa pine (Pinus ponderosa) is the major species, although some areas do contain limber pine (P. flexilis). Shrubs contained in the understory are skunkbush sumac (Rhus trilobata), creeping juniper (Juniperus horizontalis), rocky mountain juniper (J. scopulorum), and western snowberry (Symphoricarpos occidentalis) (Bureau of Land Management et al. 1974:276).

The herbaceous layer is mostly grasses such as green needlegrass (Stipa viridula), sandberg bluegrass (Poa secunda), prairie junegrass (Koeleria cristata), stoney hills muhly (Muhlenbergia cuspidata), or side oats grama (Bouteloua curtipendula). Sites with coarser soils will contain bluebunch wheatgrass (Agropyron spicatum), little bluestem (Andropogon scoparius), or porcupine needlegrass (Stipa spartea). Silver sage (Artemesia cana) may also be present (Bureau of Land Management et al. 1974:277).

Sandhills Grassland Zone:

This is an area of sand dunes and very sandy soil, mainly present along the north bank of the North Platte River. The major grass is prairie sandreed (*Calamovilfa longifolia*). Other species are needleandthread grass (*Stipa comata*), Indian ricegrass (*Oryzopsis hymenoides*), blue grama (*Bouteloua gracilis*), hairy grama (*B. hirsuta*), sand dropseed (*Sporobolus cryptandrus*), sandberg bluegrass (*Poa secunda*), and scattered sand bluestem (*Andropogron hallii*). Silver sage (*Artemesia cana*) is the dominant shrub. Small soapweed (*Yucca glauca*), fringed sage (*Artemesia frigida*), and cudweed sagewort (*A. gnaphalodes*) may be locally abundant (Bureau of Land Management *et al*.1974: 271).

Clay Slope/Alkali Badlands Zone:

These occur as scattered areas throughout the Basin wherever there is a concentration of alkali or deeply dissected drainages. The vegetation contains a shrub layer of gardner saltbush (*Atriplex gardnari*), black greasewood (*Sarrcobatus vermiculatus*), rubber rabbitbrush (*Chrysothamnus nauseosus*). If there is more water, such as along a alkali stream channel, four wing saltbush (*Artiplex canescens*) (Atlantic 1976a:124), and winter fat (*Eurotia lanata*) will be present. The understory includes inland saltgrass (Distichlis spicata), squirreltail (Sitanion hystrix), and alkali bluegrass (Poa juncifolia). In areas with greater moisture alkali sacaton (Sporobolus airoides) and nuttall alkali grass (Puccinellia airoides) will also grow (Bureau of Land Management et al. 1974:274-275). Wild buckwheat (Eriogonum pauciflorum) (Atlantic 1976a:124), and wild rose (Rosa woodsii) will grow on exposed clay slopes.

Shortgrass Productivity

Effective moisture, as approximated by annual precipitation or some similar variable, is the main determinant of the net primary productivity of the shortgrass plains. Grass biomass is correlated to precipitation with coefficients on the order of .90 to .95 (e.g. Noller 1968). Vegetational response to historic droughts has been well documented (cf. Ellison and Woolfolk 1937; Coupland 1958; Tomanek and Hulett 1970). Under such conditions there are rapid, drastic reductions in grass biomass and basal cover as well as major successional changes.

On an annual to decennial scale, shortgrass communities respond to occassional bad years with losses in plant height and some loss of biomass and basal cover. After four or five years of below average moisture, increasingly significant effects accumulate. Losses in biomass and basal cover reach 70 to 90% (e.g. Coupland 1958:288). Such losses are not replaced with species adequate for forage and can be equated to significant reductions in carrying capacity of game animals. Cumulative effects in the hydrologic system, in water tables and soil moisture for example, accentuate the drought and increase the difficulty of recovery. However, when the rains return, plant yields increase rapidly and reach predrought levels in four to five years.

Periods of extended above average moisture lead to reciprocal major increases in biomass yield, and plant communities reach what is considered a postclimax stage. According to Coupland (1958:290) the yield in 1955 of a large area of Northern Mixed Prairie "was 237 per cent as great as in 1944, even though the vegetation in that region had been considered to have been fully recovered from drought by 1944". On a "second-order" scale, such as the 200 year episode discussed here, the affect on the grasslands is more pronounced. During the Protohistoric Period, it would not be out of line to consider grass biomass to be raised by a factor of 200 percent, and maintained there most years. During this period there was an increase in productivity and carrying capacity of a magnitude seldom seen on the postglacial Great Plains.

Historic 7 or 8 year droughts do not provide an accurate analogy for more extensive droughts, such as the droughts of the Altithermal or Atlantic climatic episode (Antevs 1948, 1955; Bryson et al. 1970), a dry period from around 5500 to 3000 B.C. Droughts occurred with much greater frequency and duration during that episode (see Dansgaard et al. 1970: Figure 3). Grass biomass in affected areas would have dropped to 10 to 20 percent of historic averages, and often would have been beaten back to even lower levels. Localized or less frequent floresces are expected, however, in a span of some two thousand years. Areas such as the northern plains border were less affected (Reeves 1973:1221; Wedel 1961:254). Shortgrass can expand into plains border areas under such conditions, replacing drought-stricken prairie grasses, but in no case would this compensate for the incredible reductions of productivity on millions of square kilometers of the main plains. Animal populations and cultural systems would still have to adapt to much lower carrying capacities.

Buffalo Populations

Buffalo populations, with high mobility, a generation span of only 3 years, and with fertility immediately affected by nutritional condition of the animal (Pete Gardener, personal communication) were quite sensitive to fluctuations in grass productivity (on any of the scales discussed above). Under drought conditions one would expect higher mortality rates and lower fertility to be reflected in irregularities in age pyramids. The magnitude of the climatic pertubation and the closeness of the population to carrying capacity should control the magnitude of this effect upon age structure and survivorship rates. Behavioral responses to drought probably include movements towards river valleys, foothills, and similar areas. If longer spans are significantly deviant from the mean of previous spans, say a 200 year period with severe droughts and on the whole deficient moisture, we would expect more drastic depression of survivorship rates and regional population levels.

During a positive fluctuation of such a second order scale we would expect increases in population levels, less irregular age structures, and generally higher fitness and increasing body weight. If a series of relatively frequent moisture peaks carry over grass cover and soil moisture, and damp out the effects of a few intervening dry years, each moisture peak would tend to pick up the growth curve of buffalo population and accelerate it further. Such factors meant that actual population maxima occurred just after actual moisture peaks, and that high population levels of buffalo tended to extend beyond the maximum of the Little Ice Age.

If a climatic episode of "third-order" scale (that is, up to several thousand years duration) is sufficiently deviant one may predict increasingly significant effects. Widespread, frequent drought such as existed during the Altithermal should include greatly depressed survivorship rates and population levels, increasingly deviant age structures, and overall decreases in fitness. We could be dealing with extended periods when much of the western plains could not have supported viable buffalo populations. Carrying capacity approximations indicate only a few million buffalo, constrained most years to riverine areas, montane situations and shortgrass areas on the north and east of the plains, with sporadic forays onto the High Plains after a number of good years. In support of such a view, it must be remembered that bison populations during the Altithermal were affected beyond such factors as the depression of survivorship rates, the tolerances of the species as it then existed were exceeded, and stress was of a severity to result in evolution towards the smaller Bison bison.

Several lines of evidence have been analyzed to translate climatic conditions into buffalo carrying capacities (Reher in press). These include such things as the thickness and spacing of bone levels in buffalo jumps, the densities maintained for National Park herds, and a series

of modern range studies citing climatic conditions and grass biomass produced. Such studies also rely heavily on demographic analysis of kill site mandible samples, which allow reconstruction of survivorship rates, age structures and overall fitness (Frison and Reher 1970; Reher 1970, 1973, 1974; Reher and Frison in press; Wilson 1974).
For the purposes of this study suffice it to say that buffalo population values derived agree with estimates by early explorers (eg. 30 to 60 million buffalo), and secondly, that they show these population levels on the Protohistoric and Historic Plains could only have been attained under conditions well above average.

Culture Ecology of the Western Plains

There are four main operational areas in an ecological model for these groups, and in fact for any Western Plains group. These are (1) effective moisture, (2) the net primary productivity of shortgrass (3) the distribution and density of buffalo populations, and (4) the distribution, density, organizational complexity and other parameters of Plains cultural systems (see Reher in press). All ecological models are oversimplified, for their main purpose is to present a more comprehensible picture of a complex, dynamic ecosystem. But because of the relatively unique characteristics of the shortgrass region, a deterministic stance can be taken with more confidence than for most other biomes. In a theoretical sense, at least, it is a straightforward logical progression from climatic episodes such as the Little Ice Age to grass productivity, to buffalo populations, to the Powder River Basin tribes and the sites they left.

In other words, consideration of the significance, location, and potential of cultural resources in the Powder River Basin is necessarily a consideration of the shortgrass ecosystem. Three of the main operational areas have been outlined above - climate, vegetation, and game animal populations. This section is devoted to examination of some of the predictable relationships between men, their sites and the environment. We must first consider certain parameters of generalized hunter-gatherers highly dependent on plant foods, primarily the Plains Archaic period. We then examine the parameters of adaptations more highly dependent on hunting big game. The latter is typified by people during the Paleo-Indian period, and much of the Late Prehistoric. The most extensive use of the Powder River Basin was probably constrained to a great extent to a hunting adaptation. As we shall see, movement back and forth along a continum of strategy from plant dependent to meat dependent results in very different types of sites and different site locations.

Aptly characterized by Wedel (1961) as a "land of sun and wind and grass", the ecology of the western sector of the High Plains has a dominating effect on any human adaptation, greatly restricting the variety of successful subsistence strategies that can be employed. Extensive use of true grassland areas over the past 10,000 years has been dependent on exploiting grazing animals and has dictated low population densities. Less extensive use of the basin interior, and a greater dependence on exploitation of edible plants, was tied more closely to the diverse vegetation of broken topography, surrounding foothills and mountains. Today, ranching is the main occupation in Campbell and Converse counties. Present adaptation is thus still highly dependent on grazing animals, and population densities are as low or lower than they were for historic Plains tribes. Such a close fit between environmental and cultural parameters allows statements concerning culture ecology to be made with more confidence than for many culture areas.

The semi-aridity, the high variability, the low resource diversity of the shortgrass ecosystem all place constraints directly upon a Plains economy. A heavy dependence on meat, a high reliance on storage for winter subsistence, a high degree of mobility, and other traits were dictated for all aboriginal cultures. Social subsystems and ideological subsystems were greatly affected by these economic necessities, if the current understanding of cultural ecology by anthropologists is reasonably correct. For example, any tendencies towards territorial exclusion are counter productive in an ecosystem where the vagaries of climate, grass, and animal movements require an ability to shift and move on a regional scale. Completely flexible social systems incorporating a far-flung alliance network that allowed families to shift hundreds of miles in the course of a few months were therefore necessary. Such ethnic networks were becoming more rigid and bounded toward the historic era, but this was an unavoidable effect of population densities increasing rapidly to carrying capacities, and the concomitant hostility and competition over resources. As we shall see, an exceptionally cool, moist episode in the 17th and 18th centuries (known as the "Little Ice Age") is the critical variable in understanding the florescence of historical Plains Indian culture in the Powder River Basin.

Dependence on Plant Foods

Extensive use of the Powder River Basin was dependent on wild game, chiefly the buffalo, due to the large grassland areas. However, strategies could shift through time towards greater dependence on plants, and even classic buffalo hunters such as the Cheyenne ate 35-40 species of plants. Before going on to consider the ecological parameters of big-game hunting adaptations, it is appropriate here to discuss parameters and resources more directly relevant to plant gathering in the study area. Although people at any time could have made use of such vegetable resources, the cultural ecology of the "Archaic" period has always been the classic example of such strategies.

Archaic or "Desert Culture" sites in western North America are assumed to reflect the technological leavings of small groups of hunters and gatherers who used a highly mobile, broad-spectrum foraging strategy in response to seasonal scheduling in the availability of numerous plant and animal resources. Although exploitation of certain seeds, roots, greens, etc. may be concentrated during the few weeks when they are available, true specialization and focalization is usually not possible; a number of species are exploited at any one time, and knowledge of buffering options is always necessary for years when a primary resource does not have sufficient productivity. These concepts have been developed from archeological impressions gained of assemblages at numerous rock shelters and open sites throughout the Southwest, the Great Basin and other areas:

> At present the Desert Culture is seen as oriented towards exploitation of many species, as opposed to being oriented

> upon big game animals (Jennings 1968: 156).

> The evidence reflects a way of life appreciably different from the earlier period in much increased vegetable gathering orientation and lack of larger animals...In the westerly sites the vegetable gathering orientation is, if anything, intensified with reflections in artifacts of small numbers of projectile points and hide working tools and an increase in numbers of manos and metates. Fires are much more commonly large pits filled with burned stones which would seem to be roasting pits for vegetable products (Mulloy 1958:209).

> Altogether the evidence from the Late Middle Prehistoric Period suggests again small groups of nomadic people who sometimes lived in caves but more often occupied open camp sites with perishable shelters. In some localities emphasis on food gathering is noted and larger animals appear to have been little used, although they are not entirely absent (Mulloy 1958:213).

Recent studies of hunter-gatherer adaptations in arid ecosystems, which have emphasized subsistence practices, have reconstructed a similar pattern of heavy reliance on plant foods (such as noted by Lee for the !Kung Bushmen, by Silberbauer for the G/wi Bushman and by Gould for Australia).

> Vegetable foods comprise from 60-80 percent of the total diet by weight. The men also collect plants and small animals but their major contribution to the diet is the hunting of medium and large game...although men's and women's work input is roughly equivalent in terms of man-day of effort, the women provide two or three times as much food by weight as the men (Lee 1968:33, see also Lee 1969).

> Esculant plants are the basis of G/wi subsistence. They are the source of the major portion or even, at times, the whole of the daily diet (Silberbauer 1972:282).

> Over fifty percent of the diet of these people is regularly made up of vegetable foods drawn mainly from a list of at least eight staples. ...large game constitutes only a small part of the diet. Small game is more important as a source of protein (Gould 1969:16).

Presumably then, sites of broad spectrum hunters and gatherers reflect the availability of plant foods in the immediate site vicinity. The size of this associated area, or site "setting", is the range of pedestrian subsistence activities. This is defined by the productivity of the various resources and the physiological limits and energy cost-return ratios of men and women employing a foraging strategy. While men can range somewhat farther, including hunting trips lasting several days, the foraging area of women tied to a base area by infants and young children is easily documented as 3-4 miles (with an extreme maximum of 5-6 miles). Time and energy spent in foraging at maximum distances decreases efficiency rapidly. Other variables, the size of the group involved, the productivity of individual types of resources, the percent of diet contributed by the wider ranging men and so on, must be considered in any elegant treatment of this model. A series of supportive ethnographic analogies describing such processes can be cited, including Silberbauer (1972), Lee (1968, 1969) and Gould (1969). A series of plots of the actual location of procurement and processing activities for the G/wi Bushmen by Silberbauer (1972:298-301) are especially informative.

Because of such considerations, research concerned with the explanation of regional settlement patterns has shifted its emphasis from the actual location of cultural materials towards the environmental context (in terms of the "significance" of cultural resources", the environmental context clearly has as much significance as the site itself). The location of Archaic-like sites should be quite predictable according to settings where women could maximize a diverse set of plant resources (see Reher and Witter in press). We can assume site locations of more specialized hunters were less biased by such considerations, but these people undoubtedly also located sites according to such parameters whenever and wherever they could. This sort of principle is simple, but generalizable, and should prove useful in the Powder River Basin as it has in New Mexico, other parts of Wyoming, or the Kalahari Desert of Africa (Robert Hitchcock, personal communication, 1977). In this fashion, the theory of culture ecology can be extended to cultural resource management. This is the concern of other chapters in this volume.

Plant Resources in the Powder River Basin

There is a wide variety of plant resources available in the area for exploitation by anyone choosing or having to "live off the land". Following is a preliminary list arranged alphabetically (by scientific name) of plants known to be present in the center of the basin and their prehistoric uses. This list of available plants was extracted primarily from vegetation lists in two coal mine environmental statements (Atlantic 1976b:Appendix A-1, Atlantic 1976a:Appendix E). Numerous plants present along the borders of the basin were not included due primarily to a lack of knowledge and available data on those areas. As information becomes available, the list will be updated. Other uses might be apparent, but may not have been recorded ethnographically.

Acer negundo - Boxelder - sap tapped and used for sugar making. Also used for food seasoning (Yanovsky 1936:41).

Achillea millefolium - Common yarrow - used by Sioux for treatment of childrens ailments (Mails 1972:115). Leaf mashed and applied to sores. Root boiled and drunk to cure indigestion (Steward 1938:310).

Agropyron spp. - wheat grasses - seeds eaten (Yanovsky 1936:7) (Steward 1938:21).

Allium textile - prairie onion - bulbs eaten raw or cooked (Yanovsky 1936:11).

Alycine apios - potato bean - grows along the North Platte River. The tubers are eaten. (Grinnell 1972: 179).

Amaranthus graecizans - prostrate pigweed - young plants used for greens (Yanovsky 1936:23).

Amelanchier alnifolia - Saskatoon service berry - berries eaten raw or boiled and made into a paste that was saved for winter use (Yanovsky 1936:30) (Steward 1938:21). Tea from the leaves used as a beverage and in healing (Grinnell 1972:176).

Arctos taphylos uva-ursi - Bearberry - fruit eaten raw or cooked. Dried and ground it could be made into bread or mush. Fruit also used for seasoning meats. Juice used for cooling drinks (Yanovsky 1936:50). Used for persistent pain in the back, especially a strained back. Leaves and berries are boiled together and the liquid is drank. Wetted leaves are rubbed on the painful place. Leaves also mixed with red willow or tobacco and smoked (Grinnell 1972:183).

Artemesia biennis - biennial wormwood - "seeds" eaten (Yanovsky 1936:59) (Steward 1938:21).

Artemesia gnaphalodes - cudweed sagewort - ceremonial plant used for many purposes. Spread about the lodge on ceremonial occasions. Used to wipe off ceremonial paint. The body of a person who has committed a fault was purified by wiping over with a bundle of sage. Dried leaves were burned on a coal to make a smoke used to purify implements used in ceremony. The smoke was also used to drive away bad spirits or bad or ominous dreams (Grinnell 1972:190). Whole plant boiled for drink or to bathe small children with fever. Also drunk for colds. Root juice used for sore eyes (Steward 1938:310).

Artemesia ludoviciana - Louisiana sagewort - seeds eaten (Yanovsky 1936:59).

Artemesia tridentata - big sagebrush - seeds pounded for pinole (Yanovsky 1936:59). Seeds eaten most places where other foods scarce. Wood used for fire apparatus; bark for bags, clothing, etc. (Steward 1938:22).

Asclepias speciosa - showy milkweed - leaves and young shoots boiled with meat, flowers eaten raw or boiled. Buds boiled for soup or with meat. Seeds eaten raw, inner part of fruit eaten raw. Sap used for chewing gum (Yanovsky 1936:52; Grinnell 1972:184) (Steward 1938:22).

Prunus virginiana - chokecherry - fruit eaten fresh and dried. Used for pemmican. Bark and twigs used as a substitute for tea (Yanovsky 1936:33; Steward 1938:28).

Psoralea argophylla - silverleaf scrufpea - roots eaten fresh and cooked; or dried, ground into flour and made into cakes (Yanovsky 1936:38). It was used as a medicine to reduce fever. Leaves and stems are ground fine and boiled and the tea is drunk. For high fever the powdered leaves and stems are mixed with grease and rubbed over the body of the patient (Grinnell 1972:178).

Psoralea esculenta - common breadroot scruf pea - white farinaceous and wholesome roots. Eaten fresh and cooked. Also dried, ground into flour and made into cakes (Yanovsky 1936:38).

Puccinellia airoides - nuttall alkali grass - seeds eaten (Yanovsky 1936:9).

Ratibida columnifera - prairie coneflower - leaves and cylindrical heads used as substitute for tea by Dakota (Yanovsky 1936:63). Also stems and leaves boiled to make a yellow solution. External application relieves pain and was believed to draw out the poison of a rattlesnake bite. Also used in cases of poisoning by ivy (Grinnell 1972:188, 189).

Rhus trilobata - skunkbush sumac - fruit used fresh or dried, also to make a cooling beverage. Dried leaves also mixed with tobacco to use in smoking (Yanovsky 1936:41; Grinnell 1972:180; Steward 1938:29).

Ribes aureum - golden current - berries eaten fresh or pounded into cakes and dried (Yanovsky 1936:23; Steward 1938:29).

Ribes cereum - wax current - berries used the same as above (Yanovsky 1936:29).

Rosa woodsi - wild rose - fruit eaten (Yanovsky 1936: 34; Steward 1938:29).

Rumex spp. - dock - dyes were made from various kinds of dock. Yellow dye if they were boiled alone. Red was produced by adding ash and then boiling again (Grinnell 1972:172; Steward 1938:29). Seeds eaten and roots mashed and applied to swellings and cuts (Steward 1938:311).

Sagittaria cuneata - duckpotatoe arrowhead - white nutritious tubers, slightly bitter, but pleasant tasting after roasting (Yanovsky 1936:7). Stalk below the blossom also peeled and eaten raw (Grinnell 1972:170).

Sagittaria latifolia - common arrowhead - tubers eaten boiled or roasted (Yanovsky 1936:7).

Salix spp. - willows- used for many ceremonial purposes and for arrows (Mails 1972:415). Bark of red willow was used for smoking and also scorched it could be added to dock dye to produce black (Grinnell 1972:172, 183).

Scirpus actus - roundstem bullrush (Tule) - root stocks eaten raw or used for making bread. Seeds also used for food. Young shoots eaten in the spring (Yanovsky 1936:10). Mats were made of tule to sleep on (Grinnell 1972:168).

Scirpus nevadensis - nevada bullrush - roots eaten raw and plants woven as mats for blankets (Grinnell 1972:171; Yanovsky 1936:10).

Scirpus validus - great (or soft stem) bullrush - root stocks eaten raw or pounded into flour for making bread. Pollen also used to make bread (Yanovsky 1936:10).

Smilacina stellata - false solomon's seal - berries eaten. Tender shoots eaten raw or cooked as a potherb (Harrington 1967:125).

Solanum triflorum - cutleaf nightshade - ripe fruit eaten raw or boiled; ground and eaten with mush or bread (Yanovsky 1936:56).

Soldago canadensis - Canada goldenrod - "seeds" eaten. (Yanovsky 1936:63; Steward 1938:30).

Soldago missouriensis - missouri goldenrod - leaves eaten as a salad (Yanovsky 1936:63; Steward 1938:30).

Sporobolus airoides - alkali sacaton - seeds parched, ground, and eaten dry or made into mush (Yanovsky 1936:9).

Sporobolus cryptandrus - sand dropseed - seeds parched, ground, mixed with water or milk, and made into mush or biscuits (Yanovsky 1936:9).

Stipa speciosa - porcupine grass - seeds eaten (Steward 1938:30).

Symphoricarpos occidentalis - western snowberry - fruit eaten by Sioux (Yanovsky 1936:58).

Typha latifolia - common cattail - young roots, shoots, and bases of stems eaten. Also flowering ends and seeds (Yanovsky 1936:6; Harrington 1967:220; Steward 1938:30). Dried and pulverised roots and white base of leaves given as a drink to relieve abdominal cramps (Grinnell 1972:170).

Vicia americana - american vetch - young stems baked or cooked for greens (Yanovsky 1936:39).

Vitus vulpina - wild grape - eaten fresh, but not dried (Yanovsky 1936:43; Harrington 1967:295-297; Grinnell 1972:180).

Yucca glauca - small soapweed- stems and flowers eaten raw or cooked. Seed pods boiled for food. Root can be used for soap (Yanovsky 1936:15; Harrington 1967:336-339). Baskets could be made of split strands of Yucca (Grinnell 1972:246).

Dependence on Wild Game

Increasing utilization of the grassland biome is synonymous with increasing dependence on meat. The degree to which buffalo (Bison bison) were available for exploitation is the inverse of the degree of dependence on game and plant resources from bordering mountain areas and from riverine and juniper scarp enclaves. Such enclaves exist on the Plains with greater frequency than might be expected and were certainly utilized heavily (Wedel 1963;

Reher 1971), but these resources cannot by themselves provide a secure basis for extensive occupation of grassland areas. Enclave areas on the shortgrass plains were often occupied only seasonally, (Wood 1971; Reher n.d.a) within some broader system of transhumance. Conversely, buffalo alone were not economically nor nutritionally sufficient for a plains adaptation. The Cheyenne, who were in the Powder River Basin during most of the Late Prehistoric and Historic Periods (Grinnell 1972:1-33), are typical of plains hunters yet also ate 35-40 wild plant species, raided rodent seed caches, and hand-carried water to plots of corn on the North Platte and Laramie Rivers as late as the mid 19th Century (Grinnell 1972: 250). Murdock classifies northern plains hunters as averaging around 80 to 90% dependent on hunting (1967).

Animal food resources available in the area included Bison (Bison bison bison), antelope (Antilocapra americana), deer (Odocoileus sp.), (both mule and whitetail), elk (Cervus elaphas) and bear (Ursus sp.) among the larger forms. The archeological record shows the greatest dependence was on bison procurement. A discussion of bison procurement follows later in this chapter.

Evidence of communal trapping of antelope is present in the Powder River Basin at a site in Crook County about eight miles east of the Campbell County line. This site consists of a small (2x3 meter) pit dug into a hillside with wooden drivelines forcing the animals to enter the trap. Similar traps have been documented archeologically in the Green River Basin of Wyoming (Frison 1971b) and ethnographically from the Great Basin area (Steward 1938) and the Little Missouri River area (Grinnell 1972:289). Structures of this form may be found in any portion of the Powder River Basin at any time. This type of site will not be visible for very long, however. The wooden portions of the Little Missouri Breaks Trap have already been highly disturbed by weathering and historic use for firewood. This may explain why other similar structures have not been recognized in the Powder River Basin.

Occasional deer remains have been recovered from archeological sites in the Basin area. The sample from sites within the study area is extremely small, due mainly to the small number of excavated sites. No large scale communal deer procurement sites are recorded from the basin. The best site of this nature is found north of Cody (Smith 1970, Frison in press) where at least fifty deer were recovered.

Elk bones are extremely rare from archeological sites until the Late Prehistoric Period (Frison in press). Elk are present today in the basin but have never been recorded in the archeological record. A few records of bear are known from the Northwest Plains (Frison in press) but again there are no records from the Powder River Basin. A single individual was present in a bison kill site in the Black Hills, however (Walker, 1975a).

The use of other mammalian forms as food has been recorded both ethnographically and archeologically. (Steward 1938:33-43) lists the following animals as food among the Great Basin Shoshone (these forms are also found in the Powder River Basin): Blacktail jack rabbit (Lepus californicus), whitetail jack rabbit (Lepus townsendii), cottontail rabbit (Sylvilagus nuttallii and S. audubonii), gophers (Family Geomyidae), ground squirrels (Genus Spermophilus), prairie dogs (Genus Cynomys), and packrats (Genus Neotoma), among other forms. The badger (Taxidea taxus), coyote (Canis latrans), ferret (Musteta nigripes), lynx (Lynx canadensis), bobcat (Lynx rufus) are among the carnivores forms that have been recorded ethnographically as having been used by Indians, although not always for food (Steward 1938:33-43; Clark 1975). All of these animals have been recorded from Wyoming archeological sites (Frison 1962, 1967b, 1973, 1976, in press; Walker 1974, 1975a, 1975b; Husted 1969; among others), and were available in the Powder River Basin prehistorically (Walker 1975b:55-56).

The use of fish, birds, and insects has also been documented from sites in Wyoming, although again they have not been reported from sites in the study area, due primarily to the lack of totally excavated sites. Frison (1967b) reported suckers (Catostomus sp.) from the Piney Creek Site. Walker (1975b) reports at least three species of fish were present at the Medicine Lodge Creek Site but specific identification was not possible. Birds have been reported from several sites of all time periods (Walker 1975b; Zeimens and Walker 1975; Wilson 1974; Frison 1967a, 1967b, 1971; Frison, Wilson and Walker M.S.; among others). These include species from most avian families, including ducks (Families Anatidae), grouse (Family Tetraonidae), hawks (Family Accipitridae), eagles (both bald (Haliaeetus leucocephalus) and golden (Aquila chrysaetos)) and several members of the order Passeriformes (Families Tyrannidae, Corvidae, Icteridae, Fringillidae). Any of the species present in the study area today (Atlantic 1976b:Appendix X) could have been and probably were utilized by the prehistoric inhabitants of the area.

The ethnographic use of insects by Shoshonean groups was recorded by Steward (1938) and Regan (1934) among others. Mormon crickets (Anabrus simplex) and large red ants (F. formicidae, Pogonomyrmex sp.) were recovered from the Eden-Farson Site in Sweetwater County, Wyoming (Frison 1971a). Large numbers of the mormon cricket were also found in a fire hearth in Leigh Cave (Frison and Huseaus

1968). These insects are present in the Powder River Basin today (Atlantic 1976b, Appendix X) and sites in the basin hold the potential for containing their remains.

Productivity of a Buffalo Hunting Strategy:

When available, individual and cooperative buffalo hunting represented a strategy of high energy and protein potential that could attract agricultural and hunting-gathering groups from all points of the compass - from behind the Rockies, from the Boreal Forest, the Plateau, the Eastern Woodland, and from prairie river valleys. The number of groups dependent to some extent on buffalo is truly impressive (see Roe 1951: Appendix G). Such considerations are a recurrent theme in study of plains adaptation:

> When the reindeer, buffalo, and moose abounded, the Crees were then the peaceful possessors; the animals have disappeared and with them the ancient lords of the forest. Scarcely do we meet with a solitary hut...For the Crees have gained the buffalo plains and they contend for them there with the Blackfeet, whose mortal foes they have become (Father DeSmet, 1845, in Mandelbaum 1940:184).
>
> During Late Prehistoric times the western Plains and adjacent Mountains appear to have become attractive to several groups of sophisticated eastern farmers. It is tentatively suggested that the attraction may have been an increasing buffalo population which could be tapped by trapping and other communal techniques (Mulloy 1958:214).

Limiting Factors and Carrying Capacity:

Stored meat products gained from large kills were often necessary for periods when the intense plains winter limited subsistence-oriented movement (Frison 1967:4, 34, 49, 1973: 79). In earlier decades these stores were obtained by the Powder River tribes by use of the buffalo jump; after they obtained the horse, stores were garnered by widespread scouting and attacking herds from horseback. While probably not the case every winter, during an especially bad winter or series of bad winters, stores could represent the difference between starvation and survival. Frigid spells average 20 days per winter and spells of a week with the temperature range being only from -21°C (-5°F) to -38°C (-35°F) are common (Calef _et al_.1957). One or two are associated with high winds, snowfall and extreme ground blizzards. Grinnell states:

> Although making some provision against a time of scarcity as did most tribes of the buffal plains, the Cheyenne yet often faced want...no matter how tempestuous the weather or how bitter the cold, if food was lacking, men were obliged to hunt. Often while out in the winter after buffalo, they were chilled to the bone by the bitter winds and were caught in blinding prairie snowstorms and obliged to camp for days, perhaps without fuel, often freezing hand and feet. If the buffalo disappeared, the young men, must make long journeys in search of them, and often their sufferings from the fatigue, hunger, and cold were very great (1972:258).

The buffalo products gained from fall and winter kills can be termed a main "limiting factor" (Odum 1971:106) for human population on the Plains; it is not unwarranted to define human carrying capacity in terms of buffalo numbers available for cooperative, storage-oriented ventures. Large cooperative kills are assumed to be more important than individual hunting and certainly were more productive, per individual, in pre-horse times.

Critical Density:

It would be overly simplistic to approximate carrying capacity in buffalo numbers without further consideration of the processes involved. Frison hypothesized that since cooperative kills required the gathering and manipulation of several hundred animals, either in one jumping event or a series of pounding events, there is a density threshold below which buffalo may have been present but not at all sufficient (1973:6). He recognized as a consequence there must be more than a "critical number" of animals in a gathering area, and with anything less the probabilities of a successful kill rapidly decrease. Frison's analysis is based on observed differences between buffalo behavior when in very small groups and when in large bunches. The analytical concept of a critical threshold says nothing about exactly how many animals can be run into a pound or over a jump, but that too few animals in a gathering area make cooperative kill ventures unfeasible (which seems straightforward enough). The Gros Ventre once ran three buffalo into a pound, but three is not the critical number, as Arthur maintains (1974:103). The Gros Ventre did not construct the pound and settle down for the winter because they saw three animals, but only when the presence of numerous buffalo made it appear that a series of communal kills was feasible.

We may also speak of the critical number in terms of regional densities, as these determine the overall probabilities of sufficient numbers of buffalo being found in some gathering area. Congregations of buffalo could raise local populations well above the critical level, allowing hunters to operate a kill when regional densities would not predict such situations. These do not, however, represent the dependable, attractive resource that drew large numbers of people onto the plains. The same density parameters apply to the horse nomads of later decades. Below a certain density, bison would not supply sufficient winter stores and they must go in search of them. If populations of the necessary density still could not be located, groups might have to fragment into much smaller units and scatter about the Powder River Basin so that they could exist on the lower buffalo numbers.

Stampeding a herd over a jump-off or operating a series of pounds requires an estimated 100 to 300 animals. Not every animal in a gathering area can be vacuumed up and forced over a jump, and with the repeating of successful and unsuccessful attempts this forces the "critical number" well above numbers actually killed. It is likely closer to 500 to 1000 animals, especially if several kills are to be run over a period of weeks. This number is roughly a constant, but varies somewhat according to the topographic features of each kill. The actual densities associated can vary considerably as a function of gathering area size. Topography allowing animals to be gathered from large areas requires a lower density than smaller, topographically limited gathering areas (although the latter would probably be more efficient.)

Predator-Prey Interaction:

Feedback relationships between human and bison populations may not have been completely regularized during this relatively short Late Prehistoric Historic period, but such processes certainly were established in some fashion over the 12,000 years that men hunted bison on the Great Plains (see Reher 1974; Wilson 1974). One can be overwhelmed by historic accounts of incredibly large herds, but estimated predation of plains tribes range upward to

2,000,000 buffalo annually, a significant percentage of total populations (Roe 1951:501). Effects of prehistoric predation are less clear. Frison stated, "it does not appear possible, in terms of the methods used, that more than a negligible percentage of the total number of animals in a specific area could be taken during any year" (1973:6). However, cooperative kills remove large percentages of prime cows and calves and some bulls from a gathering area. The effects of this kind of predation on local population dynamics, at least, are immediate and drastic.

A series of kills could have reduced prey densities below the critical number. Data on Great Basin antelope procurement are indirectly comparable. Steward (1968:72) noted that after one set of Shoshoni pounding operations, antelope populations in a basin were unsuitable for further kills for as long as ten years. Speaking of the Crow in 1805, Larocque said:

> They wander about in leather tents and remain where there are buffaloes and elks. After having remained a few days in one place so that game is no more so plentiful as it was they flit to another place where there are buffaloes or deers and so on all year round (Burpee 1910:56).

Acquisition of the horse represented a drastic increase in predation efficiency, as well as different hunting strategies. Wide-ranging reconnaissance, killing from horseback, and higher mobility of the whole group replaced jumps and pounds in many areas. With a predator search radius multiplied by a factor of 5 or so, effects on local buffalo populations were significant (as just noted by Larocque). Even when only a few horses had been acquired, the benefits would be shared among the members of the society. Secoy (1953:35) notes, "we may be sure that horses were more important to the Plains nomad in bison hunting than in either transportation or warfare, since, when tribes had very few horses, they were used entirely on the hunt". Wissler (1914) notes how the horse widened "ranging" of tribes, Ewers (1955:304) notes the advantage of the horse in winter transport of surplus meat (the horse being 8 times as efficient as the dog), and Holder speaks of the expansion of potential hunting territory (1970:112). However, it will be noted below that as the horse increased hunting territory, the continuing in-migration and the intrinsically high population growth rate of indigenous populations was rapidly decreasing available territory.

Seasonal Aggregation:

Seasonal aggregation and dispersion of affiliated bands (later of "tribal segments") was a normal and necessary part of a grassland adaptation. It can be attributed largely to a seasonal variation in buffalo behavior and numbers. These processes have been well documented in ethnography and in archaeology, but one quickly realizes there is considerable difference in the mechanisms and seasonal mannerisms proposed. These have included fall aggregation and winter dispersion (Frison 1967, 1970b, 1971, intensive hunts in both spring and fall for the Gros Ventre (Flannery 1953:53), the fall as the Blackfoot "buffalo hunting season" (Ewers 1955:128) and other variations. Arthur (1974) has presented considerable ethnohistoric documentation of aggregation and cooperative kill operation throughout the winter for the northern Plains Cree, and other groups, and notes occurrences during most other seasons. Oliver (1962) records a pattern for historic equestrian tribes of summer aggregation and winter dispersion.

Frison's expectations were based upon buffalo behavior and the restrictions this placed upon the behavior of pedestrian hunters using Late Prehistoric sites in Wyoming. The use of several kills in autumn has been substantiated by age analysis of juvenile mandibles from kill site samples (Frison 1970a:30; Frison and Reher 1970; Reher 1970, 1973, 1974; Frison, Wilson and Wilson, 1976). Arthur (1974) argues for the use of kills throughout winter as the "basic pattern". If killing activity extends through winter, this fact will be reflected in the kill site age structures. Kills in the Vore Site, for instance, were apparently laid down in most seasons. Analysis of mandibles from the Jones-Miller Hell Gap Site, excavated by Dr. Dennis Stanford of the Smithsonian Institution, demonstrates usage from late fall through all of the winter (Reher n.d.b). Frison's "critical number" hypothesis has the logical extension that kills are most successful when and where buffalo densities were the highest. Surely one could not argue the opposite. Such density can result from buffalo congregating in wintering areas, as documented by Arthur, or it can result from herds joining along a migration route or in a large rutting herd, or when funneling down to water in a predictable fashion, or something other. When regional population densities are uncommonly high, the chance of payoff in the gathering area or for any strategy will increase. It is combining such an assumption with assumptions about buffalo behavior that will allow us to predict the most likely areas for kill site locations, and how often they might have taken place; it will not be done by perpetuating a debate on what was the "real and true season" for cooperative buffalo kills.

Group Size and Integration:

The cooperative buffalo kill represents the largest economically-cooperative, socially-integrated population segment during the yearly round. This was most rigorously defined by the work of Frison (1967) at the Crow Indian

Piney Creek kill, processing area and camp site, on the west side of the Powder River Basin. He argues that a minimum of 120-150 people was necessary to provide an adequate adult labor force to operate a jump (the camp site size supported this). Apparently such groups had to split into smaller bands during seasons when buffalo behavior, buffalo densities, or other factors made such aggregations unfeasible. Although the same principle applied to historic horse nomads, the acquisition of the horse and other factors dictated a differing set of size parameters. Aggregation and dispersion was still necessary, but group sizes at some levels were consistently larger. Seasonal aggregations up to several thousand people were common in the summer (e.g., Lowie 1935:xiii, Ewers 1955: 155; Grinnell 1972:288; numerous others), while there is no evidence for such sizeable groups prehistorically.

Given the assumptions and propositions outlined to this point, documentation of an increase in buffalo populations also documents an increasing tempo of cultural intergration and cultural change. More formalized interactive structures would be expected to arise among bands aggregating almost every year than among those who had been able to aggregate at a buffalo jump once in 10 or 20 years. The lower levels in the Vore buffalo jumps are contained in varved strata. These are thin, distinct annual laminations of sediment laid down when there was a pond at the foot of the jump. As with tree-rings, these varves can be counted from year to year and their thickness is proportional to the amount of precipitation washing sediment into the pond basin. These varves, and the sources for lithic materials at the site, show that in the 1500's (roughly) bands from the Powder River Basin, from the High Plains of southeast Wyoming, and from the Missouri River tributaries of southwest North Dakota, were aggregating at this particular buffalo jump an average of only once in 25 years. (These kill levels occur just after a precipitation peak, when levels of buffalo population were highest). During the 1600's buffalo populations continued to increase and the Vore Site strata consist of thick accumulations of bone that must represent almost annual cropping. During the late 1700's the frequency and thickness of bone levels decreased as hunting methods using the horse began to replace the pedestrian buffalo jump. Although knowledge is not yet sufficient for accurate prediction, sometime during the early 1800's, the buffalo populations began to level off and then perhaps to slowly decrease.

So during the initial centuries of the Late Late Prehistoric, there was increasing frequency of seasonal aggregations on the order of perhaps 200 people. Eventually these become common, and very productive kills might allow a semisedentary group to remain together through most of the winter. Along with more consistent alliances and other integrative mechanisms, elaboration of corporate ceremonialism and other aspects of culture would be expected. The same processes occurred time and again in the more distant past, if our characterization of Powder River Basin cultural ecology is reasonably correct.

Other institutions might change little, for example the basic family level of production and consumption. While alliances among intermarrying kin groups could become very structured, we would not expect at this stage to find well defined lineal kinship systems, supra-familial units of production and consumption, numerous cross-cutting sodalities, and other hallmarks of a tribal organization. Village agriculturalists who brought this level of organization to the shortgrass ecosystem moved toward smaller group sizes and less tightly-knit organization, at least at first. The shortgrass ecosystem selects for a flexible, regionally-oriented organization, allowing families to shift to the northern Black Hills or out along the Cheyenne River, or across the Powder River Basin, wherever there are sufficient numbers of buffalo.

As time went on, the size of local groups and number of these groups continued to increase. At some point, confused by the effects of the acquisition of the horse and by the increasing encroachment of the Euro-American cultural system, groups such as these band-level societies underwent what (to an anthropologist, at least) was a major "jump-step" in cultural complexity, and evolved into the spectacular tribal florescence of the Plains Indian.

Density Dependent Selection:

During the 17th and 18th centuries, all Plains groups apparently converged towards uniquely plains-oriented tribal forms. This shift to cooperative units above the family level, institutions vested with true power and authority (the warrior routine), exclusive, ethnically defined territories, and other developments was qualitatively different from band organization. While some areas of culture had been elaborated simply as a function of increasing buffalo productivity and increasing security and intergration that it brought, we must seek other explanations of the "jump-step" in organizational complexity. Such events are uncommon in man's history. He is a creative and inventive species but his cultural capacity is also cautious and conservative; the best evidence indicates he must be nudged, pushed and finally forced to use this capacity to provide drastic cultural alteration.

The adaptive, ecosystemic model under construction here expects such cultural reorganization as a response to stress which exceeds the tolerance of the cultural system (cf. White 1949, 1959; Binford 1969). One must document stress that selects for the advantages of more specialized, more complexly organized energy-extractive subsystems. In many cases density-dependent or population stress is believed to be a significant factor (cf. Emlen 1973:267-286; Boserup 1965; Binford 1968). The new forms or organization are based on cooperation of larger numbers of people. Traditionally the increased population was seen as a consequence of new social and economic modes, and Binford's use of demography as an actual causal factor was a radical departure for anthropologists, although it is a well established principle in other ecological fields. Other kinds of stress, for example, density-independent stress such as simple climatic change, can select for cultural change, but only demographic stress can cause such selective pressure, provide the population basis to evolve organizationally, and obviate the selective pressure at the same time.

Ethnological evidence can be cited in support of a density-dependent model for cultural evolution on the Plains. Earlier accounts frequently mention camps containing three or four ethnic groups, and much travel between tribes (Grinnell 1972:39; MacGregor 1966:80; others). Later accounts refer to intermingling only of groups with long-standing alliances. More importantly, much of Plains warfare was clearly competition over access to good buffalo country. Newcomb (1950) discusses psychological and other explanations for plains warfare but concentrates on factors involving direct competition:

> ...the struggle over the rich hunting grounds afforded by the Plains must not be forgotten in assessing the causes of Plains warfare. It is possible that in the days before historic contact adequate hunting grounds were available to all of the relatively meagre population, but even in early historic times there were disputes over the most favored areas (Newcomb 1950:324).

Similarly, Leonard noted for the Crow.

> ...when game gets scarce in the part of the country claimed by a certain tribe, they remove to another part, until after a while their game becomes scarce, then they are induced to encroach upon the territory of a neighboring tribe, which will at once create a fearful strife...(Hornaday 1887:37).

Cheyenne tradition says the first battle in their westward movement was with the Assiniboine and over a herd of buffalo (Grinnell 1972:3). Similar references can be gleaned from most plains sources, for example, Secoy (1953:54, 59). The horse allowed dependence on lower bison densities, if necessary, but require expanded territory, thus aggravating populations stress which, in the view here, was already well developed.

Summary Note

The above brief characterization of the shortgrass ecosystem allows a series of specific principles to be established regarding Late Prehistoric, Protohistoric, and Historic Plains tribes in the Powder River Basin and general principles concerning all earlier occupations. All are quite relevant in working toward the ultimate objective of a rough prediction of site locations. It is data on buffalo population and behavior such as presented above, and discussion of concepts such as "critical number of buffalo in a gathering area" that will ultimately help us to specify which areas of Converse and Campbell counties will most likely contain cultural resources such as the large spectacular buffalo kill site. The reader is asked to realize a large body of data and other information has been condensed in all sections, so that the purposes of this report are not completely exceeded, but clarity of the presentation was sacrificed accordingly.

All of the cultural ecological tenants offered here require archaeological verification and support. This is in fact one aspect of the on-going kill site research project which was founded at the University of Wyoming some 12 years ago by Dr. George C. Frison. Ethnographic evidence is cited in chapter four.

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CHAPTER III
CULTURAL CHRONOLOGY

George M. Zeimens

An important step in archeological research is to attempt to determine the temporal context of the materials under study. Some of the earliest efforts in archeological studies of the various cultural areas were to gain enough knowledge of past cultural events to construct cultural chronologies. Chronologies are based on direct observation of the archeological record, and, as with any scientific endeavor, observation is the first logical step in research (Binford 1972:117-118, Sabloff and Willey 1967:330). Basic to more profound studies of the dynamics of prehistoric culture, chronological studies establish the temporal framework for prehistoric development. Chronologies traditionally describe observable changes in the archeological record and provide spatial and temporal context for studies of the intricacies of systematic interaction between man, culture, and nature. Once some degree of chronological control has been achieved, then hypotheses can be formulated and tests devised to explain observable phenomena. Test results may expose less visible data which may add new perspectives to sequential developments.

Chronological ordering of cultural remains in the archeological record from the area in question is far from complete. Many gaps exist and many horizons are poorly defined. Many items that may be diagnostic of specific developments remain to be found in a definitive context. Many features are poorly understood (rock cairns, tipi rings, petroglyphs, for example) and interpretations of them border on speculation. Although methodology is being refined rapidly, it still has definite limitations. Research in the area is still in the basic data collecting stage and many of the real problems remain to be identified.

The first major attempt to reconstruct the chronological sequence of cultural events for the area was the efforts of William Mulloy (Mulloy 1958). From stratified deposits at Pictograph, Middle, and Ghost caves in southern Montana, Mulloy visualized five broad cultural periods extending from 12,000 years ago to the present. Although his work was of a preliminary nature and contained numerous gaps, it served as the only usable outline available for over twenty years. Studies in the last eight years have greatly enhanced knowledge of the archeological record. Many areas in the record are still foggy, but with recent improvements in methodology and careful excavation of materials at key sites, much more is now known about the sequence of prehistoric developments than was conceivable in the 1950's.

The chronology outlined here is brief and is still preliminary. Recent work by George C. Frison has led to a revision of Mulloy's outline (Frison, in press). Frison describes a sequence of cultural developments which he defines in terms of five broad periods of time: Paleo-Indian which extends from ca. 11,200 years ago to ca. 7,500 years ago, the Early Plains Archaic from ca. 7,500 years to ca. 5,000 years ago, the Middle Plains Archaic from ca. 5,000 years to ca. 3,000 years ago, the Late Plains Archaic from ca. 3,000 years ago to ca. 1,700 years ago; and the Late Prehistoric Period ca. 1,700 to the Historic Era. The broad periods are further subdivided on the basis of certain horizon markers. Continuity is provided for the outline on the basis of several hundred carbon-14 dates. Frison presents much more detailed information about the various data and the gaps and problems than will be provided here.

This chronology is based on a number of key sites in Wyoming (Figure 5) with the Big Horn Basin serving as a focal point for the studies (Frison 1976a, and Frison _et al_. 1974:108-127). As far as material culture is concerned, the various periods of occupation are most easily distinguished by dated changes in projectile point styles. Some evidence is presented for developments in adaptive economic strategies, and during latter periods ceramic technology is diagnostic of certain cultural groups.

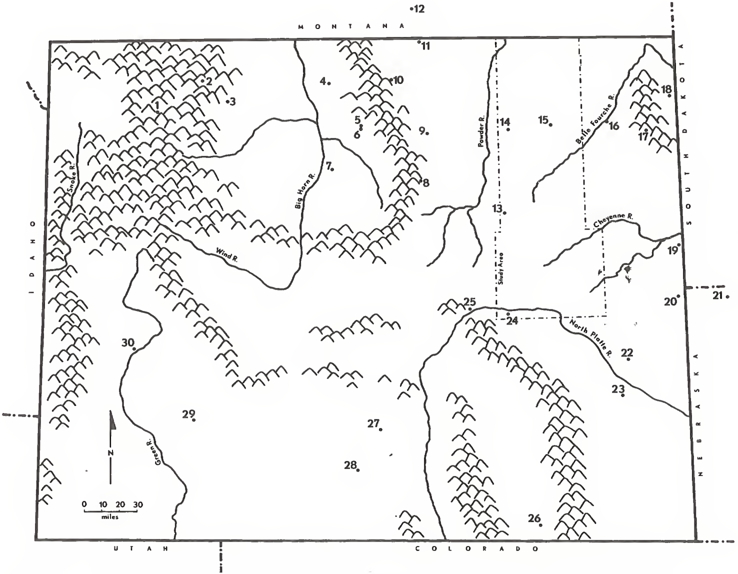

Figure 5: Major archeological sites in Wyoming and neighboring areas.

LEGEND
MAJOR ARCHEOLOGICAL SITES IN WYOMING AND ADJACENT AREAS

Figure 5

1	Mummy Cave
2	Dead Indian
3	Horner
4	Hanson
5	Beehive
6	Medicine Lodge Creek
7	Colby
8	Schiffer Cave
9	Sisters Hill
10	Big Goose
11	Buffalo Creek
12	Kobold
13	Ruby
14	Mooney Site
15	Kerr-McGee-Carter
16	McKean
17	Hawken
18	Vore
19	Agate Basin
20	Betty Green
21	Hudson-Meng
22	Hell Gap
23	Grey Rocks
24	Glenrock
25	Casper
26	Jimmy Allen
27	Rawlins Folsom-Clovis
28	UP Mammoth
29	Finley
30	Wardell

The Paleo-Indian Period, 11,200-7,500 years ago:

Apparently man first appeared in the area a little over 11,000 years ago. He arrived as a fully developed Homo sapien and possessed an advanced level of stone technology.

The oldest dated occupation in Wyoming is manifest at the Colby Site (Frison 1976b:728-730), located four miles east of Worland. Here mammoth bones and associated artifacts (Plate 1a, b) demonstrate that people were killing and butchering large animals in the area at approximately 11,200 years ago. These projectile points are of a fluted variety generally referred to as Clovis, the name derived from the type site near Clovis, New Mexico. Clovis points are not uncommon as surface finds in all parts of Wyoming but they have been found in context only at the Colby Site. Another possible mammoth kill (the U.P. Mammoth Site) near Rawlins contained both mammoth and bison bones associated with stone tools (Haynes 1967:267-286, Irwin 1970:123-125), but the diagnostic projectile points were lacking. The U.P. Mammoth Site remains to be fully investigated. Although the Clovis Complex is widespread geographically, it is not known how long it lasted or how it relates to later developments.

Another 500 years later or about 10,700 years ago, occupation is manifest in another variety of fluted points

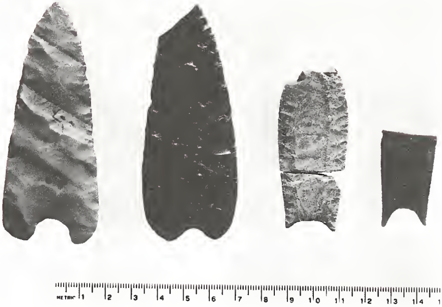

PLATE 1: Projectile Points: a,b Colby Site; c,d Hanson Site.

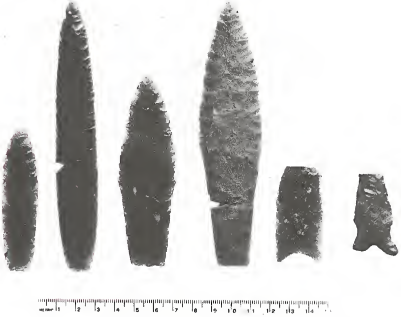

PLATE 2: Projectile Points: a,b Agate Basin Site; c,d Casper Site; e,f Medicine Lodge Creek Site.

(Plate 1c, d). These artifacts are referred to as Folsom points and are also fairly common as surface finds throughout the state. Recently they have been found in good context in a large campsite (the Hanson Site) near the town of Shell in the Big Horn Basin. This site, still under investigation, has produced several hundred artifacts and numerous butchered bison bones scattered around discrete activity areas. The activity areas are circular and contain red ochre-covered packed floors which appear to be the remains of several lodges. The site is so large that 3 years of testing have not revealed its exact limits. The artifact assemblage, fluted points, many fine graving tools, and bone needles, demonstrate that the occupants were technologically sophisticated. They were killing an extinct form of bison which may have been almost twice the size of modern animals.

Another site located near Rawlins may contain both Clovis and Folsom materials (Dr. Dennis Stanford, personal communication, 1976). This site remains to be fully investigated. Folsom points were also reported from the Hell Gap site at the south end of the Powder River Basin and at the Agate Basin Site near the Cheyenne River. Both of these sites have never been fully reported in the literature of the profession and will be discussed more below.

In Eastern Wyoming the Agate Basin Site provides solid evidence for bison killing and butchering at 10,300 years ago (Plate 2a, b). Although not common, Agate Basin points have been found at numerous locations in Wyoming. The dominant stone material used at the site is Knife River Flint, which suggests relationships with aboriginal quarries several hundred miles to the northeast. Agate Basin is the type site for this period (Agogino 1972:1-6, Agogino and Frankforter 1960:414-415, Bass 1962, Roberts 1962) and has been excavated sporadically by professionals and amateurs for over forty years, but no definitive report on the findings has ever been produced. Current investigations by the Wyoming State Archeologist and the Smithsonian Institution in an effort to salvage what remains of the site should result in a comprehensive report in the near future.

Another bison kill dated at 10,000 years ago revealed evidence for a slightly later period of occupation near Casper (Plate 2c, d). Studies have produced the most comprehensive study of bison procurement to date (Frison 1974). Hell Gap points are not abundant but are fairly common throughout the area. The Hell Gap type site in eastern Wyoming produced a long stratified sequence of materials from early periods of cultural occupations (Irwin et.al. 1973:40-53), but findings remain to be fully reported. Another Hell Gap site (Sister's Hill) which has received only preliminary investigations is located near Buffalo

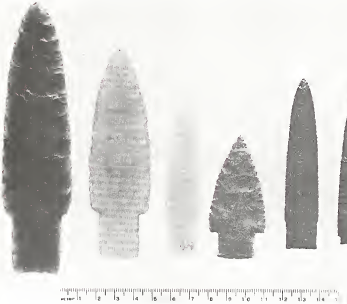

PLATE 3: Cody Complex Projectile Points: a,b Hudson Meng Site; c Finley Site; d,e Horner Site f,g 48CA12.

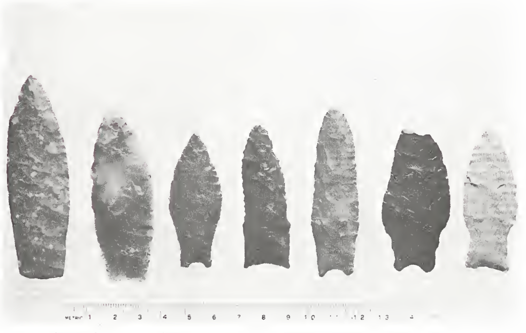

PLATE 4: Projectile Points from the Medicine Lodge Creek Area: a,b Agate Basin-like; d,e Pryor Stemmed; f,g just above Pryor Stemmed.

(Agogino et.al. 1965:190-195). Non-Hell Gap materials (Plate 2e, f) have been dated at slightly less than 10,000 years ago at Medicine Lodge Creek but remain to be found in a more definitive context.

Slightly later is another important bison kill just across the Wyoming State line into Nebraska dated at around 9,700 years ago (Agenbroad 1973). This is another example of an as yet poorly understood and poorly defined cultural horizon commonly referred to as Alberta (Plate 3a, b) from type locations in Canada, and are thought to be related to what is known as the Cody Complex (Wormington, 1957). Many isolated specimens of this type have been found in Wyoming especially in the northern mountains and foothills.

Three Cody Complex bison kills in Wyoming date from about 9,000 to 8,900 years ago. The Finley Site in the Eden Valley (Howard 1935, Moss 1951, Satterthwaite 1951), is the type site for these "Eden" materials, but a definitive report has never appeared (Plate 3e). The Horner Site near Cody (Jepsen 1953) was a large kill which produced large quantities of Eden materials, but again, a report on the site has never been published. The Horner bones and artifact assemblage (Plate 3c, d) have just recently been returned to Wyoming after thirty years, and are presently under analysis at the University of Wyoming. A third Eden kill was recently discovered near Gillette (Zeimens 1975a: Site Number 48CA12). Two points (Plate 3f, g) were found in the bone bed and investigations of this site will begin in 1977. Eden or Cody Complex (a term first used to define the Horner and Finley assemblages) materials have also been found in a very thin occupation level at Laddie Creek and in a richer level at Medicine Lodge Creek, and are fairly common in amateur collections throughout the state. Cody Complex materials were also present at Hell Gap.

All the materials described above are generally found associated with the bones of large animals. However, large communal kills represent a seasonal activity (Reher 1974: 113-124, Frison 1974:15), which usually took place in the fall or winter. Little evidence has been found to suggest what activities were engaged in by these various early groups during other seasons. One can only speculate that they were probably hunting individual large animals and exploiting smaller game and vegetable resources in small family groups, as was the pattern in later times. One cultural level at Medicine Lodge Creek carbon dated at 9,500 years ago, produced a large midden of burned bone, mostly rodents, which suggests a mixed hunting and gathering economy at that time (Walker 1975).

Cultural evidence for the period from about 9,000 yers to 7,500 years ago has been elusive but does exist.

Several sites are now known from higher elevations in the mountains and foothills in northern Wyoming. Evidence suggests light occupation during this time mainly around springs and in rockshelters or caves. Evidence for the processing of vegetable foods is the presence of milling stones and food preparation or food storage pits at several sites. There is a demonstrable sequence of changes in projectile point styles during this period. The earliest of these is a thick, usually asymetrical, rather crude looking point dated at 8,500 years ago (Plate 4a, b). It has been labeled "Agate Basin-Like" (Husted 1969) because in general outline it resembles the Agate Basin type, but in all other attributes bears no resemblance to Agate Basin styles. Several of these were recovered in what may be the remains of a lodge at a depth of 16 feet at Medicine Lodge Creek. They are common as surface finds and are often made of a metamorphosed shale which comes from the Powder River Basin.

A slightly later style also named by Husted (1969) is referred to as Lovell Constricted (Plate 4f, g). Not much is known about this type, and relationships with earlier and later types are still not clear.

Next is a very distinctive style (Plate 4c, d) which ranges in age from about 8,500 years to 7,600 years ago. Again, originally named by Husted, these are known as Pryor

Stemmed and are very common. They have been recovered in a stratified context at a number of sites. One site in particular near Kaycee yielded a quantity of data from about this period (Frison 1973:300-312). About this horizon Frison (1976a:166) states:

> "The Pryor Stemmed cultural horizon is a continuation of the carefully scheduled hunting and gathering orientation, utilizing the entire spectrum of economic resources from the basin floor to timberline..."

Stratigraphically above the Pryor Stemmed assemblages is found a rather nondescript point style which has been dated at around 8,000 years ago (Plate 4e), but like the Lovell Constricted forms, remains to be found in a more definitive context.

Other styles from this period are mentioned in the literature but remain rather obscure. Among them are Jimmy Allen (Mulloy 1959:112-116) found near Laramie, Lusk or Frederick (Greene, 1967) found near Lusk and at Hell Gap, and Angostura (Wheeler 1954:1-6) from just across the state line into South Dakota.

The Early Plains Archaic Period, 7,500-5,000 years ago:

Named the Altithermal by Antevs (1955), this period was apparently a long, warm, climatic episode of low rainfall. It coincides with a cultural hiatus over much of the Plains and other areas, although much evidence for cultural occupation has been discovered in the mountains and foothills of Wyoming. During this period there is a shift in projectile point styles to a wide range of variation of large side-notched types (Plate 5) (Zeimens 1976a). The economic orientation during this period seems to be much like that of the previous period, i.e. an annual cycle of mixed hunting and gathering. It is also similar to economic strategies of the later periods, except that during the Altithermal, activities seem to have been limited to higher elevations.

An Altithermal or Early Plains Archaic kill (the Hawken Site) has been reported near Sundance (Frison _et al_. 1976:28-57). Bison from this site are intermediate in size between the older extinct forms and modern animals. Mummy Cave (Wedel _et_ _al_. 1968) provided the first dates for Early Plains Archaic occupations from Wyoming. Similar materials appeared during the recent excavation of a number of sites in conjunction with the Medicine Lodge Creek studies which are still undergoing analysis. Lower levels at the Kobold bison kill on the western edge of the Powder River Basin also yielded Early Archaic materials (Frison 1970:1-35). Altithermal or Early Archaic cultural materials were also recovered at Patten Creek as part of the studies at Hell Gap, but have never been described.

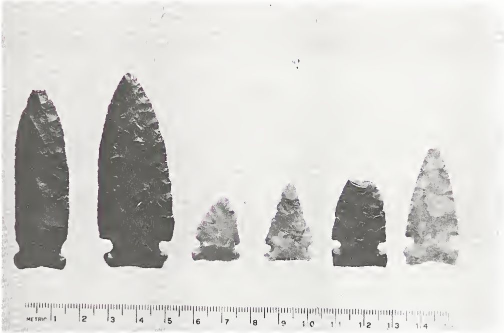

PLATE 5: Projectile Points: a,b Hawken Site; c,f Big Horn Mountains.

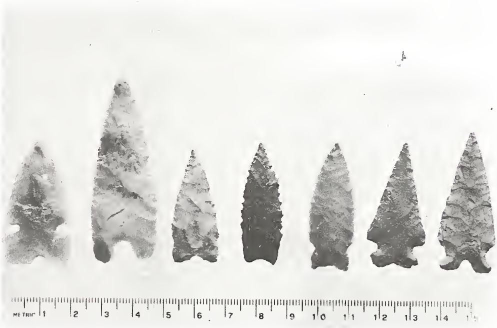

PLATE 6: Projectile Points: a-e McKean Points; f,g Buffalo Creek Site.

The Middle Plains Archaic Period, 5,000 - 3,000 years ago:

There is no cultural gap between the Altithermal and the following period. From about 5,000 years to 3,800 years ago is seen a rapid increase in human population. The interior basins begin to be utilized heavily, mainly for the procurement of vegetable foods as evidenced by the large number of milling stones and roasting pits present in the sites. Large stone-filled pits are the most common feature of this and later periods, but are not well understood. The pits will be discussed in more detail in another section of this report. The mountains and foothills continue to be occupied, but many more open campsites are present, and at a greater distance from sources of perennial water sources.

Early in the period, projectile point styles are thin lanceolate forms (Plate 6a-e) referred to as "McKean" from the McKean type site in northeastern Wyoming (Mulloy 1954:432-460). A variation of this form is side-notched (Plate 6b), and is often found in the same stratigraphic context as the unnotched type (Lobdell 1973). Both forms are very common finds throughout the state. The Dead Indian Site near Cody ranges in age from 4,400 years to 3,800 years ago, and provides a wide variety of McKean styles.

From 3,800 years to 3,000 years ago there seems to be little change in occupation patterns or economic adaptation strategies. Early in the Period projectile point styles are thought to represent variations of the McKean style. An example of these in the Powder River Basin are dated at 2,900 years ago at 48SH312 (Frison 1968a:31-39). Similar points (Plate 6f, g) have also been dated later at 2,500 years ago from the Buffalo Creek kill site (Miller 1976).

The Late Plains Archaic Period, 3,000 - 1,700 years ago:

This period is represented by a variety of corner notched points. Economic orientation remained about the same as the previous period and there seems to be an increase in the number of sites. One variety of points known as Pelican Lake (Plate 7a, b, c) are widespread geographically and date at about 3,000 years ago at Medicine Lodge Creek. Other corner notched points date from 3,000 years ago to A.D.500 (Frison 1962, 1965, and 1968b). One distinctive variety commonly referred to as "Besant" (Plate 7a, e) is dated at around 2,000 years ago at three separate kill sites. One kill about 20 miles west of Gillette (the Mooney Site) has been dated but has received only preliminary investigations. Another kill in Shirley Basin has been totally destroyed by looters who report finding over 500 points in the bone bed. The Ruby Site near Pumpkin Buttes (Frison 1971) revealed a 2,000 year old kill

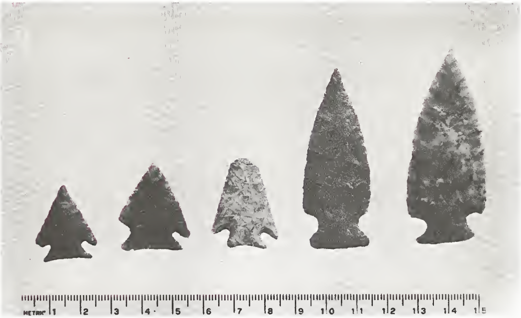

PLATE 7: Projectile Points: a-c Pelican Lake Points; d,e Ruby Site.

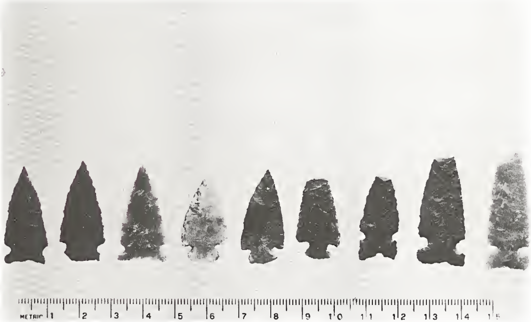

PLATE 8: Projectile Points: a-c Avonlea; d-f Woodland; g-i Big Goose Creek Site.

situation in which the animals had been contained in a corral. The kill at Ruby was associated with a camp and a large ceremonial structure.

The Late Prehistoric Period, 1,700 - 300 years ago:

The latest prehistoric period is marked by the introduction of two cultural items into the area: the bow and arrow and pottery. The bow may have arrived from the north along with small side notched points (Plate 8a, b, c) which have been labeled "Avonlea" (Kehoe and McCorquodale 1961: 178-188). Avonlea points are very common in the area and have been dated at 1,400 years ago at the Beehive Site in the Big Horn Mountains. Arrow points are smaller and lighter than points from earlier periods and are both side and corner notched. Corner notched points last until the end of the period, but there is a progressive trend toward the side notched variety which eventually begin to acquire base notches as well. This trend is highly evident in the stratified kill on Big Goose Creek (Plate 8g, h, i) (Frison 1967a), at the Vore Site (Reher 1977, Reher and Frison in Press).

Ceramics apparently arrived from all directions. The earliest pottery is a cord-roughened, straight-walled, conical type known as Woodland. Proto types for this tradition are found on the Plains to the east of the area. Woodland sherds have been found at a number of locations from the Colorado to the Montana border and as far west as the Continental Divide in central Wyoming (Reher 1971, Zeimens 1975b, 1976b, Zeimens et al. 1975). Projectile points are a small corner notched variety (Plate 8d, e, f). A single date on Woodland pottery is available from Wyoming. This is from a stratified site at the Greyrocks Reservoir near Wheatland (Plate 9). The pot is dated at 1750±110 years: A.D.200 (RL 704). Woodland period grinding stones differ from the flat metate of earlier periods (Plate 10) in that they seem to usually have a long deep trough in the center (Plate 11). Apparently Woodland groups made several excursions up the main river systems between A.D.200 and A.D. 1,000, but never really became entrenched in the area.

Another ceramic bearing tradition invaded the area from the east about A.D.1,000 - A.D.1,300. Pottery from this period is similar to that from the Upper Republican Valley in Kansas. Upper Republican groups were using small side notched points and like the Woodland groups, had no profound affect on the area. Upper Republican ceramics were apparently confined mainly to southeastern Wyoming.

Several ceramic sites contain evidence of occupation by the Crow beginning about A.D.1,500 (Frison 1976c:29-44). The Crow apparently split from more sedentary Mandan groups to the east and began to exploit the bison herds in northeastern Wyoming. Crow ceramics are fairly distinctive

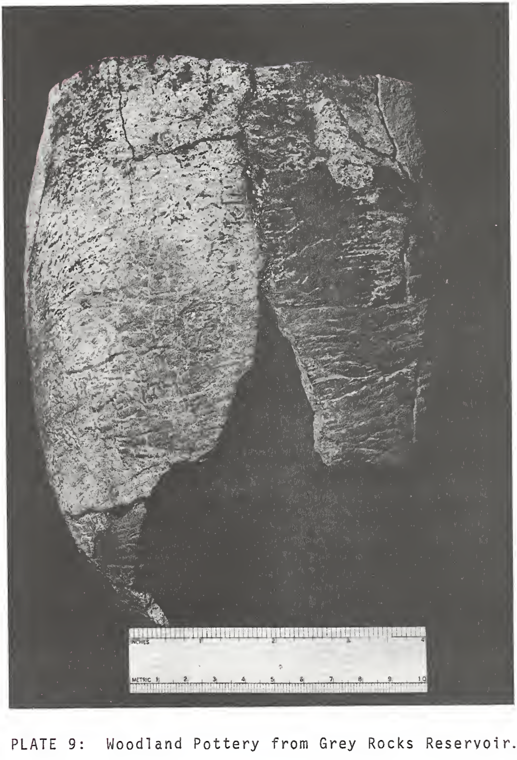

PLATE 9: Woodland Pottery from Grey Rocks Reservoir.

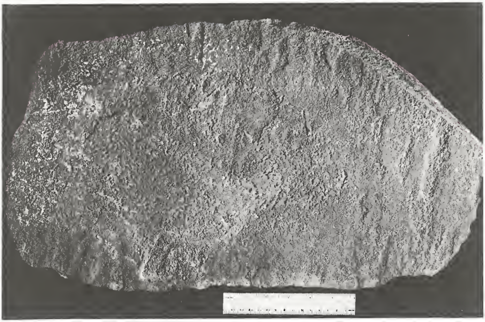

PLATE 10: Metate: Flat variety.

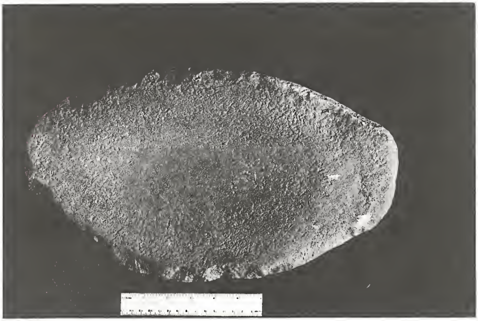

PLATE 11: Metate: Woodland variety.

(Plate 12) and sherds are common as surface finds in both the basins and mountains. As more sites are investigated and more dates are obtained it is likely that a sequence of migrations will become evident for over a period of 300-400 years.

Another ceramic tradition may demonstrate later relationships with eastern groups (Renaud 1931). Renaud describes some fragmentary sherds from along the North Platte River near Torrington which may be similar to the Dismal River or Plains Apache tradition in Nebraska. From sites in Western Nebraska, Dismal River pottery is found mixed with Upper Republican wares and also with historic materials, so apparently it spans a period of 400-500 years (Champe 1946:34). So far only a hint of this tradition has appeared in Wyoming, but almost no systematic archeological studies have been conducted in the part of the state where it has been found.

Another ceramic type labeled the Intermountain Tradition (Mulloy 1958:196) may be incipient to the Northwestern Plains area. It is distinctive (Figure 6) in that it is flat bottomed, straight walled, and has a general "flower pot" appearance. It has been found mixed with Woodland pottery at several locations (Zeimens 1975a, Nelson 1967, Morton 1954), and with Crow pottery (Zeimens 1975b, Frison 1976c, Brox and Miller 1974). It has been dated as early

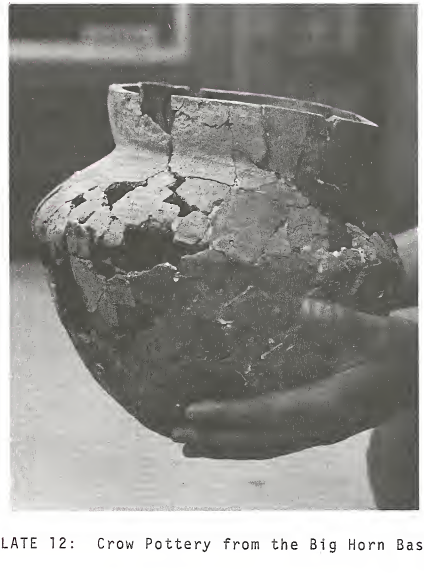

PLATE 12: Crow Pottery from the Big Horn Basin.

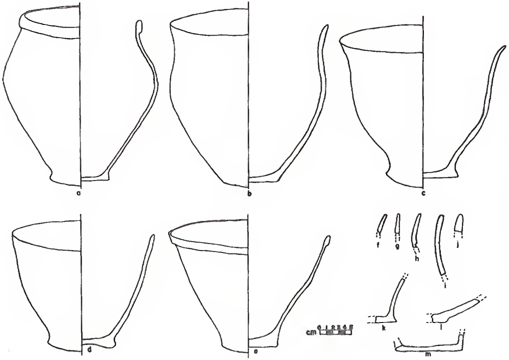

FIGURE 6: Pottery styles from the Eden-Farson (Shoshonean) site

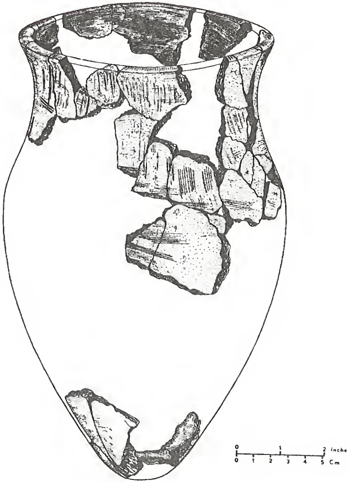

Figure 7: Pottery from the Wardell Site

as A.D.1200 (Lahren 1976) and as late as A.D.1720 (Frison 1971b). It is believed to be representative of Shoshonean occupation and apparently spans a period of at least 1,000 years. It is generally felt that it demonstrates no relationships with eastern Plains Traditions. Sapir (1923: 250-253) and Coale (1963:4) suggest that its source is from the north and that relationships can be seen between Eskimo pottery and the flat bottomed Intermountain wares.

Another tradition may also demonstrate influences from the north (Figure 7). Dated at about A.D.800 from the Wardell Site (Frison 1973b) these ceramics may represent migration of Athabascan groups from the north who later became established in the southwestern United States. Wardell type sherds have been discovered in a surface context in other areas but, like the situation with Wyoming ceramics in general, much more remains to be learned about their significance in the archeological record.

Southwestern Wyoming contains a variety of ceramic styles (Wyoming State Site File - Laramie) which demonstrate relationships with the Great Basin and areas to the southwest. Most predominant are grey wares similar to ceramics from Fremont sites in Utah. Fremont pottery may be as old as A.D.900 (Aikens 1966:59) and apparently lasted until very late. Also present are several sites containing corrugated wares (Plate 13) which resemble traditions far to the south. A few examples of black-on-white painted sherds

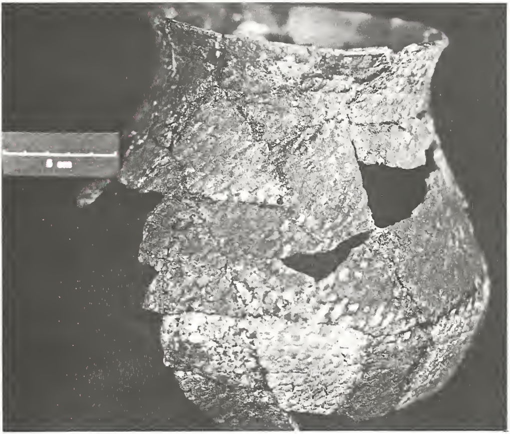

PLATE 13: Corrugated pottery from Rawlins, Wyoming.

have also been found. Again, most of the ceramics found in southwestern Wyoming remain to be discovered in a definitive context.

This brings the archeological record up to the period of European contact which has been at least partially documented in the ethnographic literature. This period is discussed in greater detail in the next chapter. Although Contact Period sites are rare, hundreds of such sites must have existed. Some sites apparently were of long duration and contained several hundred occupants. The fact that so few of these sites have been found amplifies the problems of site visibility which has been discussed earlier.

All of the periods described in this chapter are represented in the area which is the subject of this report. Much of the evidence comes from isolated surface finds which only hint that more productive sites have gone undiscovered. The present archeological sample from the area is very small, but suggests that the bulk of the archeological record remains to be investigated.

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CHAPTER IV
ETHNOLOGY AND ETHNOHISTORY

Charles A. Reher

Introduction

The following is a preliminary ethnological discussion of Plains Indian culture in the Powder River Basin of northeastern Wyoming. Its purpose is to provide the basic documentation of a particular segment of culture history (roughly from A.D.1400 to A.D.1880), and the culture ecology of a region, in order to reach an understanding of what types of cultural resources might be encountered in coal-lands development. The paper is in no sense to be considered a comprehensive anthropological treatment of these cultures, for it is in fact only an attempt to condense such information into a useable packet.

Emphasis is on Converse and Campbell counties, in the central part of the basin, although lack of specificity in most early accounts does not allow one to deal solely with these arbitrarily bounded areas. It would be a mistake in any case to restrict cultural study in such a fashion, for cultural resources are best described and understood in a regional sense. All the resources necessary for the maintainence of a culture are not found in one small locale, and this id doubly true for highly nomadic hunters such as the Plains Indian. Movement back and forth through the grasslands of Converse and Campbell counties was but part of a seasonal economic pattern also dependent on neighboring uplifts such as the Black Hills, on river bottoms and on pine-juniper scarp enclaves such as the Hat Creek Breaks and Rochelle Hills.

In a similar fashion, one should not be concerned only with this small segment of history and cultural process even within the entire Powder River region. True predictive capabilities can only result from concern with a theoretical framework which establishes general principles. To understand cultural systems and their spatial loci (i.e. sites) in the southern Powder River Basin we must understand something of the nature of all cultural systems on the shortgrass Plains. To understand prehistoric and historic adaptation on the shortgrass Plains, we must understand something of the adaptation of all cultural systems. This is the nature of theory.

Some general principles of culture ecology were established in Chapter 2 of this volume (see also Reher in press); these are summarized in the following section to set the scene, as it were, for all discussion in this chapter. This is followed by an abbreviated summary of the history of the culture of the buffalo-hunting tribes of the Powder River Basin. Finally, all of this discussion is pooled in a consideration of what types of material remains might have been left by these cultures. This is _not_ to be considered a "predictive model". Discussion based on such specific analogies may or may not prove useful in other areas of the Powder River Basin, or elsewhere on the North American grasslands or the grasslands of the world. Rather it is only a series of incipient parts of such a model, parts that are offered here beacuse they may prove useful in construction of such a model for the Powder River Basin. All of the material remains of the historic tribes are now archaeological remains, and more detailed considerations of site prediction is therefore left to the archaeological chapters of this report. Anthropological and archaeological theory is not developed to the point where all site locations and densities in a region can be easily predicted, but general guidelines can be derived. Unless we continually strive in the direction of such theory, prediction will not get any better.

With these considerations in mind, the objectives of this report may be summarized as follows:

1.) _ethnology_- a model of adaptive process on the short-grass Plains is used to propose basic principles of Plains culture ecology; the understanding gained here is the framework for explaining population movements and other historical events that were the source of cultural resources in the Powder River Basin.

2.) ethnohistory - a summary of known or probably locations of Plains tribes who used the Powder River Basin is given; some inferences can be made regarding groups in the Late Prehistoric Period, or ca. A.D.1400 to A.D.1700, from archaeological early records in other areas; statements concerning what might be roughly termed the Protohistoric Period, A.D.1700 to 1800, can be made with somewhat more confidence, although in later times, not because we yet have any Euro-American witnesses; the Historic Period in the Powder River Basin can be approximately started at A.D.1800, although most reserve its true beginnings for the Lewis and Clark expedition along the Missouri River in 1804 (historic accounts of the study area remain scanty and sporadic well into the 1840's and 1850's); the period of United States military action in the area from about A.D.1850 to 1880 is considered, and the Indian sites, forts, trading posts and battles are also discussed; for the purposes of this chapter, most concern with this period is with regard to aboriginal peoples.

3.) ethnography - a synopsis of Plains Indian culture is provided to add color to the ecological and historical fabric; economy, society, ideology, linguistic affiliation and other data are presented.

4.) discussion of cultural resources - finally, all of the above information is combined in a preliminary discussion of the types of sites and site locations that might be expected from historically known Plains Indians; as noted above, this ultimately deals with archaeological resources and this information is intended as input to the more comprehensive statements of cultural resource management found in other chapters.

Culture Ecology

Discussion

The western Plains environment did not allow high aboriginal population densities, nor did it allow a great deal of latitude to native economies. The area is semi-arid and, beyond that, it has about the most variable climate in the world. Occupation of any one area was necessarily precarious; large scale movement could be necessitated from one year to the next. Prehistoric strategies in the area could range from one highly dependent on plant foods to one highly dependent on meat. Adaptations more dependent on wild plant foods consisted of a seasonal round of movements closely tied to adjacent mountain uplifts. Use of areas such as the Powder River Basin, during certain seasons, was limited to enclave areas such as river bottoms and juniper breaks. Extensive use of grassland areas was only possible with an efficient hunting strategy. Such a strategy was only effective under conditions of high game populations, which did not always prevail.

Adaptation was always a combination of hunting and plant-gathering, but primary dependence could shift back and forth, according to the best potential pay-off. This shifting dependence caused differences in movements and differences in site locations; other constraints remain the same for either type of adaptation. In these cultural resources, we are dealing with a people who were highly mobile, probably never in one place more than a few weeks. This means, among other things, that no group of sites in one area ever represents the total cultural inventory of these peoples, and it is difficult to assess the significance of one site without a better understanding of the total settlement pattern. Along with the highly mobile, highly flexible nomadic pattern, we can expect there were concomitant responses in social systems. These would also have been highly flexible and would have allowed shifting of families among "alliance networks" over hundreds of thousands of square miles. Either type of adaptation also remained highly dependent on storage for winter subsistence; winter is the limiting season in the shortgrass region, and the productivity of all other seasons comes to nothing unless one can make it through the winter.

Consideration of more specific aspects of culture ecology of the Powder River Basin are outlined below. This is merely to make more meaningful the consideration of ethnohistoric resources in the area, which is the main purpose of this chapter. Detailed treatment of the cultural ecology is found in Chapter 3 (this volume). These ethnohistoric processes can only be understood and explained with regard to such a broader framework of ecosystemic theory, so a brief restatement is appropriate here.

The main point is that because of the relatively unique nature of the shortgrass ecosystem, direct deterministic statements can be made with more confidence than for most biomes. All ecological models are oversimplified, their purpose being to represent complex ecological dynamics in more straightforward fashion, but on the shortgrass Plains there is less variation possible. If we can reconstruct the climatic situation, we can reconstruct shortgrass productivity with something like 90-95% accuracy. If we can reconstruct shortgrass productivity, we can predict the density and behavior of buffalo populations. If we can control for buffalo populations, we can reconstruct in relatively direct fashion the density of human populations and their economic behavior. And most importantly, from economic behavior and population densities, one can predict the main outlines of essentially all other cultural behavior, be it sociological or ideological.

Adaptation of Generalized Hunters and Gatherers

In dealing with Late Prehistoric, Protohistoric, and finally the Historic tribes, we are dealing with people who were increasingly dependent on big game hunting. This section is less relevant for our purpose here and more effective for consideration of much older segments of the cultural resource record. However, the Plains hunter still made much use of edible plants, and these parameters are relevant to their adaptation; if to a lesser extent.

Women gather almost all plant foods. As people are more dependent on vegetable food, they increasingly locate sites so as to have access to areas of diverse vegetation. The productivity of these resources seldom allows true specialization, and any focalization is never for more than a few weeks. Generally, a number of species are exploited at one time - one or two "staples", a few more that are useful and palatable, several more that can be used to augment the diet if others fail to produce, and yet a larger number that are available if absolutely necessary.

The only way such a diversity of edible species can be obtained is to locate sites in areas of maximum diversity, areas where four or five plant communities (or a larger number of smaller plant associations) are in juxtaposition (see Chapter 3). In the Powder River Basin, these usually occur in areas of more diverse topography (see Chapter 6).

A number of site-setting studies have been done which document the tendency for plant - dependent hunters and gatherers to select areas of maximum plant diversity (Reher and Witter in press; Galvan 1976), from northern Wyoming to New Mexico to the Kalahari Desert (Robert Hitchcock, personal communication). In such a setting we can usually identify on the order of 30 to 50 edible plant species within a mile radius of a site or less. Although just one aspect of a generalized hunting - gathering ecology, and in fact only a simple principle of general anthropological knowledge, it was mentioned because of its use in cultural resource management. It allows certain very definite expectations of site distribution in areas such as the Powder River Basin. With a good regional sample it can be used to predict, in quantifiable fashion, site numbers from little more than aerial photographs.

Adaptation of Specialized Plains Hunters

When dealing with the historic equestrian tribes, we are primarily dealing with hunters of buffalo. Here the effects of environment on cultural adaptation is especially critical. All the evidence to date (see Reher in press) indicates droughts and bad winters limit buffalo populations well below the carrying capacity of intervening good years. If the drought cycle, for example, is in some fashion stopped, the potential for increased grass biomass and increased buffalo population is tremendous. Within a few human generations, a short time in archaeological or ecological spans, buffalo populations can double, treble, perhaps even increase four times.

This increase apparently caused wide-scale migration onto the Plains time and again in the past. The historic florescence of Plains Indian culture must be understood as the culmination of one of these events, an upsurge in moisture, grass and buffalo known as the Little Ice Age, which lasted from about A.D.1500 to 1800. In addition to a small resident population, people moved onto the Plains from east and west in the Boreal Forest of Canada, from the Missouri River Valley and other such areas, and from the Great Basin and Plateau areas behind the Rocky Mountains. Many other people used the buffalo in seasonal hunting trips from Plains border areas. People often changed their culture over completely, from sedentary agriculturists to nomadic hunters, in 2 or 3 generations.

Human populations were tied to buffalo populations in the Powder River Basin more directly than even this might indicate. The intense Plains winter often made these people completely dependent on stored meat products. The only consistent way to build up such stores, in pre-horse times at least, was through the use of cooperative buffalo jumps and pounds. These required high buffalo densities to operate, densities well above average if such kills were to operate all about a region on a systematic basis. At every juncture, we find close, regularized ties between human and buffalo populations in the Powder River Basin.

In an adaptation based on such large game kills, people must go where the buffalo are. Generally, we find that several groups aggregated for social reasons as well as to ensure the appropriate labor force necessary to process large amounts of meat. The size of this aggregation increased through time. After people acquired the horse, the young hunters could range out much further, and buffalo jumps and pounds were no longer utilized. Group size increased even more, and the largest aggregations could remain together longer. In four centuries, such seasonal aggregations increased from 100 to 200, from 200 to 2000, to close to 10,000 (the latter were partly a response to resistance to the American military, but only sufficient buffalo populations made such groups possible).

Along with increased group size and more frequent integration came cultural elaboration, and also increasing competition over the best buffalo country. The wide-ranging ability of the horse aggravated this competitive situation, as did continued in-migration of other peoples. Eventually this stress changed elaboration to evolution - groups became more highly integrated, labor cooperation was formalized with highly developed kinship structures, and warrior societies began to gain life-and-death authority. Cultures evolved from a "band-level" society to "tribal-level".

All of the Historic era of Plains Indian culture must be understood in terms of such process. These processes are discussed in much more detail in Chapter 3, but this brings us to the known tribes of the Powder River Basin. These were people responding to a climatic pulse and the concomitant sudden and drastic increase in buffalo populations, a people living a rich, secure existence because of the buffalo but at the same time constantly on the edge between starvation or survival. These were among the most mobile people in the world, people to which 400, 500, or 1000 miles was but another move, to be carefully planned and then done. These were a colorful, dashing people, who probably deserve the place they have come to hold as the symbol of the North American Indian. They have become this symbol because it all happened within the historic record, but general principles of cultural ecology and archaeology demonstrates they were but the latest example of 12,000 years of adaptation to the western grasslands.

Tribal Distribution in the Powder River Basin

Tribal distributions in the Powder River Basin must be understood as a series of population movements, as different ethnic groups competed for a stake in the rich buffalo plains. Many were drawn out onto the plains by the rapidly increasing buffalo populations of the Little Ice Age, often changing over their culture in only two or three generations. For other groups, these factors must be combined with the realization of radiation of "Mississippian" populations, the ultimate origination of which can be traced group by group back to civilizations in the Eastern and Southeastern portion of the continent. Some groups were more or less forced out into the Powder River and Missouri Plateau, but only the secure subsistence provided by a hunting economy allowed this to happen. Without these high buffalo populations, we might envision groups such as the Teton Dakota clinging to Prairie and Woodland homes with much more tenacity, knowing "their back were to a wall," or else being forced to the west and fading into obscurity.

The Late Prehistoric - Historic era being considered here was the most spectacular, because of the horse and gun among other things, and the best known because of documentation by the expanding Euro-American civilization, but the same processes had occurred time and again in the past. The great grasslands have dominated the central North American continent for thousands of years, sighing to the periodic rhythm of changes in rainfall, luring peoples out with the promise of incredibly rewarding hunting, only to dry and expell them again.

Men entered the New World in the cool-moist terminal Pleistocene (around 12,000 years ago). He might have been the first and he might not, but he found the Plains rich with untapped large game. A Plains Paleo-Indian cultural florescence, probably the highest development in the continent at that time, was cut short by the Altithermal droughts around 8000 years ago, and man retreated to the mountains and basins and became more a forager. Conditions alleviated and he returned to the edges of the western Plains, using them more heavily and farther out when game increased, retreating back when game disappeared. Occasionally we are permitted a glimpse of yet another florescence of big game hunters, as the accidents of geological preservation leave a few buffalo kill sites here, a few there. The best known of these for the Archaic period (ca. 5000 to 1500 years before present) are found in the Powder River Basin. The Ruby Site (Frison 1971) near the Pumpkin Buttes south of Gillette (A.D. 200) had a sophisticated, winged corral for trapping buffalo and a large boat-shaped ceremonial structure that was more complex than anything seen at a later date. It is undoubtedly but one such site from a florescence lasting several hundred years.

Other than during the worst of the Altithermal, there must always have been a small resident population on the Western Plains. But without buffalo of above average numbers, these were generalized hunters and gatherers who used Plains "enclaves" such as river valleys and scarps more than large grassland areas, and whose camps in these enclaves was closely tied to mountain uplifts where a wider diversity of resources could be obtained. The grasslands by themselves did not present the basis for well established settlement systems. All of the populations discussed here, even the horse nomads, still, of necessity, used wooded river bottoms and mountain areas. The first Americans in the area, residents of Ohio or Virginia or New York, were dismayed by the apparent bleakness of the Plains environment. Early expeditions such as Fremont's south of the Powder River Basin, speak of the "barren and arid country", and "the few stunted and dead pines", all wearing the same ashen hue of desolation" (Nevins 1956:125). Indeed, it is a barren country unless one has large game populations and the knowledge to exploit them. Such writings lead to a concept in the American mind of the western Plains as the "Great American Desert", and early anthropologists spoke of the region as uninhabited prehistorically, or as only sparsely populated along the margins (Wissler 1914; Kroeber 1928).

Later archaeological work has shown that such concepts were erroneous, at least in part (Strong 1935; Ewers 1955; Wedel 1963; numerous others). Occupation of areas such as the Powder River Basin was sparse, but it was not completely uninhabited nor as temporary and sporadic as some had thought. Archaic-like peoples have apparently made fairly continuous use of select areas well out onto the Plains in addition to the floresces of the economy based more on grassland hunting.

There were influxes of people during the earlier portion of the Late Prehistoric Period (around A.D.500 to

1400). Increasing buffalo populations were probably the main factor in drawing a large migration of Athapaskan speaking peoples south out of the Boreal Forest of Canada. Some went well out onto the Plains and the last groups may have been those in eastern Wyoming in the initial Little Ice Age. Others followed more intermontane routes, and the Wardell buffalo kill on the Green River Basin of Western Wyoming (dating around A.D.600, Frison 1973) is one of the very few sites documenting these migrations. Eventually most of these people were to arrive in the Southwestern United States and form the numerous Apache and Navajo.

A second influx involved agricultural populations from the Eastern Prairies. First Plains Woodland cultures from well before A.D.1000 and then Upper Republican peoples from about A.D.1100 to 1250 carried a mixed horticulture-hunting-gathering strategy up river valleys such as that of the North Platte, becoming more dependent on bison (see Wedel 1961; Wood 1971; Reher 1971). Moving westward they approached the summer rainfall limit on agricultural success and, as many had done before and would do afterward, groups budded off into southeastern Wyoming and the southern Powder River Basin and Black Hills to become Plains hunters and gatherers.

A change to much drier conditions by the 1300's apparently caused Upper Republican peoples to fall back, far to the east. Archaeologically there is almost a cultural hiatus during the 1400's, although a small resident population of Athapaskans, and Shoshoneans from behind the mountains, is possible. This episode sets the scene for the coming expansions of the Little Ice Age.

Assignments of tribal locations during the earliest period are not completely speculative, but they are based on scanty archaeological data and none of a historical sort; they are arbitrary extensions back in time of later distributions as much as anything. It is a problem that has been extensively treated in the literature for over 50 years, and using different references one can move groups hundreds of miles and hundreds of years in any direction he chooses. Early anthropologists quickly made use of the earliest available Spanish and French records, so nothing really new has come to light historically. Very little has been found archaeologically to add to this picture, due to the paucity of materials and the difficulty of making ethnic identifications. Pottery is most useful in identifying ethnic tradition, but is often scarce and not really exact either. Analysis of lithic sources used can pinpoint the territories involved with dated levels in a buffalo jump (Reher n.d.c.), but this can only lead to the same sort of speculation as to who exactly was in the territory at that time. If there has been any tendency in recent anthropological work, it has been to push the dates for the entry of various groups onto the Plains back to earlier times. As with earliest known acquisitions of the horse (see Wissler 1914), we must assume that a definite date implies that the actual beginning of the phenomena was then earlier yet. An attempt is made to show distributions discussed in very schematic fashion in Figures 8-12.

The term "tribe" is used here in the sense of "ethnic group" because of its common usage in this sense, especially when refering to names of Plains groups later to be known in the Historic era. Such use here does not imply then any characteristic or complexity of social and political organization, such as common to separate "band-level" societies from "tribal-level" societies. By such criteria many of these earlier groups were not tribes, evolving such complexity only in later centuries.

Tribal Distribution - A.D.1400-1600

Real evidence for cultural distribution in the Powder River Basin during this period is almost nonexistent, but at least three sets of groups are most likely (Figure 8). Earlier migrations of Athapaskans from the Boreal Forest and later, known locations just to the south are probably linked by resident populations in the Powder River Basin

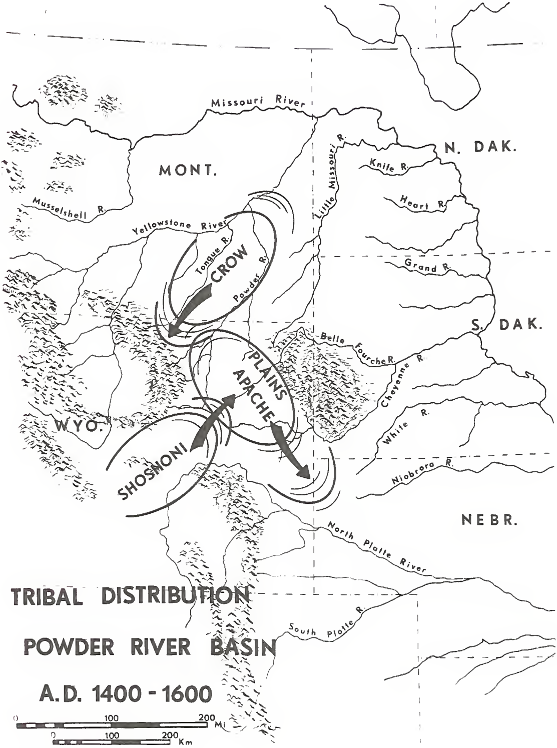
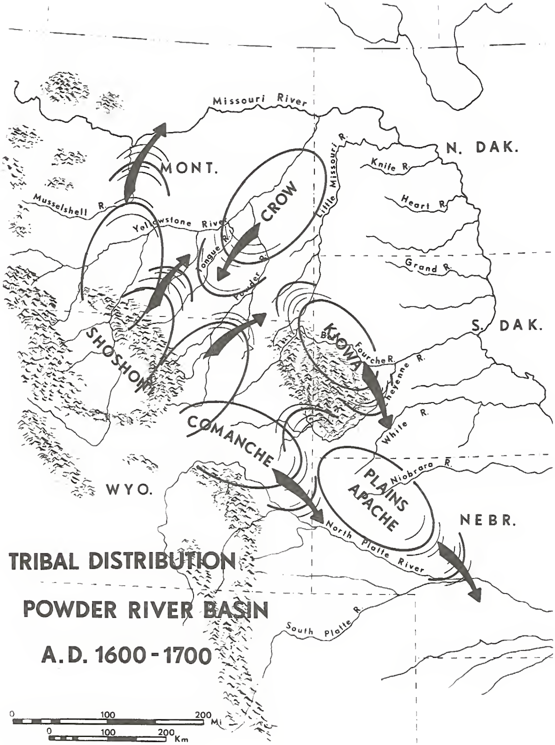

Missouri River
MONT.
N. DAK.
Little Missouri R.
Knife R.
Heart R.
Musselshell R.
Yellowstone River
Tongue R.
Powder R.
CROW
Grand R.
S. DAK.
Belle Fourche R.
Cheyenne R.
PLAINS APACHE
White R.
WYO.
SHOSHONI
Niobrara R.
NEBR.
North Platte River
South Platte R.
TRIBAL DISTRIBUTION
POWDER RIVER BASIN
A.D. 1400 - 1600
0
100
200
Mi
0
100
200
Km

Figure 8



TRIBAL DISTRIBUTION
POWDER RIVER BASIN
A.D. 1600 - 1700

Figure 9

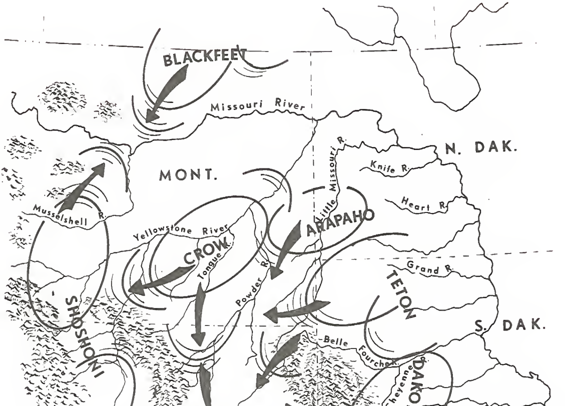

BLACKFEET
Missouri River
MONT.
N. DAK.
Knife R.
Heart R.
Little Missouri R.
Musselshell R.
Yellowstone River
CROW
Tongue R.
Powder R.
ARAPAHO
Grand R.
TETON
S. DAK.
SHOSHONI
Belle Fourche R.
Cheyenne R.
DAKOTA
White R.
Niobrara R.
CHEYENNE
WYO.
NEBR.
North Platte River
KIOWA
South Platte R.
TRIBAL DISTRIBUTION
POWDER RIVER BASIN
A.D. 1700 - 1800
0
100
200 Mi
0
100
200 Km

Figure 10

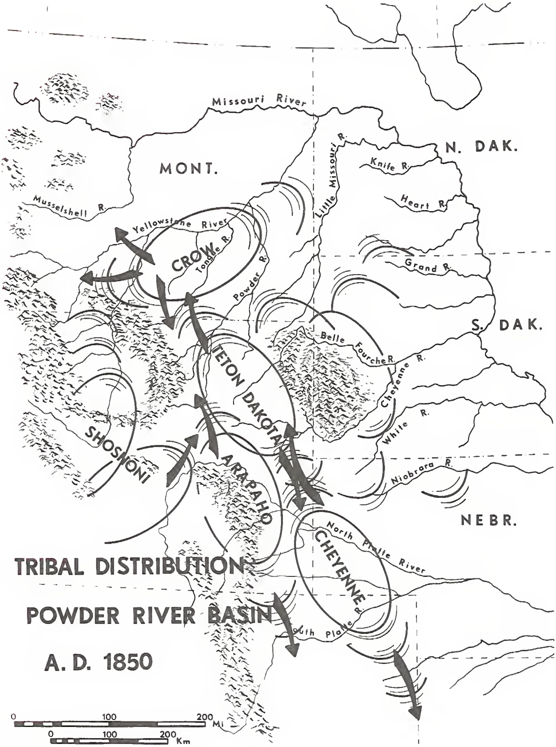

TRIBAL DISTRIBUTION
POWDER RIVER BASIN
A. D. 1850
Missouri River
MONT.
N. DAK.
S. DAK.
NEBR.
Musselshell R.
Yellowstone River
Tongue R.
Powder R.
Little Missouri R.
Knife R.
Heart R.
Grand R.
Belle Fourche R.
Cheyenne R.
White R.
Niobrara R.
North Platte River
South Platte R.
CROW
TETON DAKOTA
SHOSHONI
ARAPAHO
CHEYENNE
0
100
200
Mi
0
100
200
Km

Figure 11

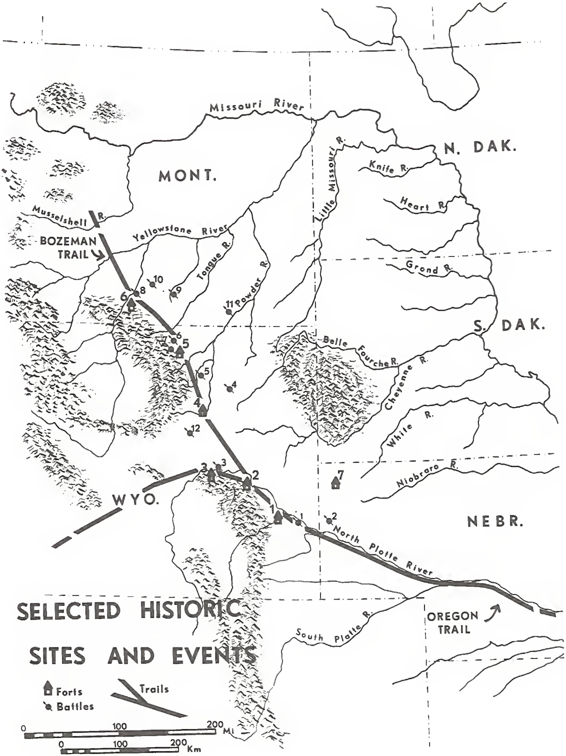

SELECTED HISTORIC
SITES AND EVENTS
Forts
Battles
Trails
0
100
200
Mi
0
100
200
Km
Missouri River
MONT.
N. DAK.
S. DAK.
NEBR.
WYO.
Little Missouri R.
Knife R.
Heart R.
Grand R.
Musselshell R.
Yellowstone River
BOZEMAN TRAIL
Tongue R.
Powder R.
Belle Fourche R.
Cheyenne R.
White R.
Niobraro R.
North Platte River
South Platte R.
OREGON TRAIL
1
2
3
4
5
6
7
8
9
10
11
12

Figure 12

LEGEND

LOCATION OF HISTORIC EVENTS AND PLACES CONCERNING THE POWDER RIVER BASIN TRIBES AFTER A.D.1850

Figure 12

Forts

1. Fort Laramie
2. Fort Fetterman
3. Fort Caspar
4. Fort Conner, Fort Reno
5. Fort Phil Kearny
6. Fort C.F. Smith
7. Fort Robinson

Battles

1. Lt. Grattan and command killed, 1854
2. Gen. Harney attack Little Thunder's Brule Sioux, 1855
3. Lt. Caspar Collins killed at the Platte Bridge fight, 1865
4. Red Cloud and Dull Knife attack Sawyer's wagon train, 1865
5. Gen. Conner destroys the village of Black Bear's Arapaho, 1865
6. Cpt. Fetterman and command killed by Sioux and Cheyenne, 1866
7. Wagon Box fight, 1867
8. Hayfield fight, 1867
9. Gen. Crook fights the Sioux and Cheyenne at the Battle of Rosebud Creek, 1876
10. Custer and command killed on the Little Big Horn, 1876
11. Col. Reynolds destroys the village of Two Moon's Cheyenne and Low Dog's Oglala, 1876
12. Gen. Crook destroys the village of Dull Knife's Cheyenne, 1876

during this time period. There is also evidence that Athapaskan Groups such as the Sarsi were continuing to come out of the north much later. Such groups could have come into the Powder River area at any time, and would not have to be the last groups from the larger, earlier migrations. At a later date the Gattacka (Kiowa-Apache) ranged from just south of the Black Hills to the Platte River, and they must have resided in the Powder River area at some earlier time. Source analysis of lithic materials at the Vore Site, a deeply stratified buffalo jump in the northwestern Black Hills, shows that most peoples during the later 1400's and 1500's were coming from southeastern Wyoming, the Gattacka area. It is likely that such Plains Apache groups therefore still had the eastern Powder River Basin as part of their territory. Since the southeastern bands were integrating with other bands from the northwestern Powder River Basin (a conclusion also based on sources for lithics) it is probable that groups from the northern basin were of the same Plains Apachian cultural affinity. Secoy (1951) has demonstrated that later references by French and Spanish to the Padouca applied to the Comanche, but earliest references to a people around the southern Black Hills and western Nebraska were to Plains Apache, probably a Lipanan Apache group. Given their location these Plains Apache, too, would have resided in the Powder River Basin at some time from roughly 1400-1600, and may have used it until much later.

The second cultural substratum are the numerous Uto-Aztecan speaking Shoshoni and Comanche groups such as the Wind River Shoshoni, ultimately of Great Basin origin. Expanding into the Wyoming Basins, and then out along the front of the Laramie and Big Horn mountains (Shimkin 1939) the "Snake" were among the first to take advantage of the expanding buffalo populations of the Powder River Basin. In later centuries as horseman they were to expand far out onto the Plains striking fear into the hearts of all other Plains peoples. During the first centuries their range was probably restricted to an initial expansion out into the southern and eastern part of the Powder River Basin.

Anthropologists and historians have considered the Crow as splitting from the Hidatsa anywhere from A.D.1450 to 1700 (Lowie 1935; Hewes 1948; others) and slowly moving out along the Yellowstone, reaching the northern Powder River Basin much later. Work with Crow pottery sites by Frison (1976) has indicated they were in the Northern Powder River Basin along the Big Horn Mountains by the 1500's. Obsidian associated with earlier dates shows that they had already been as far west as Yellowstone Park or were intermingling freely with Shoshoni from that area.

Finally, we might mention the Tanoan-speaking Kiowa as a possible inhabitant of the northernmost Powder River Basin at this time. Their movement through the area. was somewhat later, but given the tendency to discover increasing antiquity for the location of various groups, they may have been hunting in the study area earlier than suspected.

Tribal Distribution - A.D.1600-1700

During this century we are dealing with a continuation of many of the trends just discussed, and the start of a further series of migrations (Figure 9). During this century the Crow had ranged through the Black Hills, across most of the Powder River Basin, and into the Big Horn Basin. Pottery finds stretch into south-central Wyoming but it is not known whether this represents actual Crow bands or women who had been stolen by the Shoshoni. During the latter decades of this century, the explosive expansion of the Shoshoni who first got the horse, may have pushed the Crow back down the Yellowstone, making it appear they had only just reached the lower Yellowstone.

In the early part of this century there was apparently a continuing expansion of Shoshoni and Comanche south of the Crow, which began to drive a wedge between the Plains Apache (Gattaka and Padouca) and their former northern range. From approximately 1650 to 1690, these groups also had fairly direct contact to the Spanish Southwest and began to rapidly acquire horses. The Shoshone had a distinct advantage over their more northern neighbors, and began to expand rapidly to the northeast while the Comanche began to expand to the southeast against the Plains Apache. The Snake probably dominated the Powder River Basin during much of this century.

It becomes more likely that some Kiowa groups were reaching the northern Powder River Basin by the 1700's perhaps skirting the Shoshonean expansion around to the Black Hills and the east side of the basin. Spanish sources place them as allies of the Gattacka, and thus probably just to the north of these groups in the Black Hills - east Powder River Basin area (Mooney 1895:157).

The first well founded mention of the Gattacka was by La Salle in 1681 (Hodge 1912:701). They are placed west of the Pawnees, or just south and east of the Powder River Basin in southeastern Wyoming-Western Nebraska. The Padouca are in the same area, perhaps slightly south (see Terrell 1975). The presence of the Padouca Apacheans along the southern edge of the Powder River Basin is documented archaeologically back to at least A.D.1650 by the "Dismal River" materials (Gunnerson 1960). Lithics in the Vore Buffalo jump during this period show there still was a strong input of peoples from southeast Wyoming into aggregations in the northern Black Hills. This may show a continued extension of Plains Apacheans along the easternmost Powder River Basin, or it may simply show that the Shoshoni had taken over both the northern Powder River Basin-Black Hills area and the southeastern Wyoming quarries as well.

Tribal Distribution A.D.1700-1800

Ethnic distributions are increasingly well known during this century (Figure 10). During the early decades the Snake continued their wide-spread expansion, mostly to the north and northeast. Pitched battles were fought with the Blackfoot and Piegan and other groups into north Montana and Saskatchewan. Snake raids were feared well into Canada as late as the 1770's (see Cocking, in Burpee 1909; see also Saukamappee's accounts to David Thompson, in Tyrrell 1916:328 or Secoy 1953:34). The sons of Verendrye ventured along the north Powder River Basin in 1741 and 1742 from the Mandan Missouri River villages; it was noted that their men greatly feared the Snake and a number of Pawnee guides left them upon encountering signs of Snake villages. They did meet groups of "Horse Indians" west of the Black Hills who were probably the Snake (Wissler 1914:13-15).

The Comanche continued a like expansion to the south and away from the Powder River Basin, pushing most of the

Plains Apachean before them. By 1740 they controlled the area from the Platte Rivers to New Mexico, and the Mallet Brothers expedition through the southern Plains area reported meeting a few Plains Apache groups highly fearful of meeting the more numerous "Laitane" (Comanche) (Secoy 1951:527).

During the latter decades of the 18th century the Blackfoot, Kutenai, Flathead, Salish and others began to get sufficient horses, and then an advantage in numbers of guns, and began to rapidly push the Snake back across Montana and into the Rocky Mountains (e.g. Secoy 1953:51; Newcomb 1950:322).

The same processes apparently allowed the Crow to gain firm control of the northern Powder River Basin, along the northern Big Horn Mountains and out along the Powder, Tongue, and Yellowstone Rivers. They were also reported as including in their territory the southwestern Powder River Basin down to the North Platte and as far across as the Laramie River (Hodge 1912:368).

During much of the 1700's the Kiowa were allied with the Crow and controlled the Black Hills area (Hodge 1912: 699; Mooney 1895). Sometime during this period they were joined by the Kiowa-Apache, who then joined them in their subsequent southward drift before the pressure of the Cheyenne, Arapaho, and Sioux.

Sometime in the early to middle 1700's the Cheyenne extended out into the country east of the Black Hills and then apparently around the south end of the Black Hills and into the Powder River Basin. They were proceeded in this movement by a related tribe, the Sutai, who must have been there earlier (Grinnell 1972:1-30; Hodge 1912: 251). The Cheyenne provide an apt example of the process of migration into the Powder River Basin. It occurred in a relatively short time, 3 or 4 generations at most, and during much of this span there were both completely nomadic Cheyenne bands and others who were still agriculturists on the tribal lands of the Missouri. They extended their movements up through the eastern Powder River Basin into the headwaters and along the Little Missouri River, and south establishing themselves on the North and South Platte rivers, pushing the Kiowa before them. Somewhat earlier the Arapahoe also started a drift south and west from a more northerly position, eventually into the Powder River Basin and down towards the North Platte, where they became closely allied with the Cheyenne.

Much of the Cheyenne movement can be attributed to pressure from the east by the numerous Teton Dakota (Sioux), who were themselves being forced westward by the persistant attacks of the Chippewa. The various Sioux were the last to arrive in the Powder River Basin, not crossing the Missouri until around A.D.1750. By 1770 they had forced the Cheyenne from the Black Hills, and they then continued their sweep westward across the Powder River Basin, into northern Wyoming and southeast Montana (Hodge 1912:376; Hewes 1948:51). They eventually became close allies with the Northern Cheyenne in the Powder River Basin and along the Platte rivers, but continued to contend with the Crow over the northern border areas between them.

Tribal Distribution - A.D.1800-1850

The Historic era on the Northwestern Plains really begins with the records of Meriwether Lewis and William Clark along the Missouri River in 1804-05. The distributions just discussed were stabilized and maintained, for the most part, during the first half of this century (Figure 11). The Teton Dakota were dominant on all sides of the Black Hills, and thus in the study area. Numerous references make it clear that they were pressing so strongly against the Crow along the Powder River, Tongue River and up to the Yellowstone River, that this was the next step in the Sioux expansion, and more than only a series of raids against a neighboring group (eg. Marquis' account (1928) of the life of Thomas LeForge among the Crow).

In the early 1800's, up to about 1830, the Crow controlled the western half of the Powder River Basin down as far as Fort Laramie. After this, they made less and less use of the area and were being pushed back to the northwestern part. During much of this time there was an overlapping, buffer zone along the Powder River, so that both Crow and Dakota groups might be found there.

The Cheyenne by this time had established a marked north-south division, with the southern division ranging from the South Platte River down into eastern Colorado and western Kansas and Oklahoma. The "home territory" of the northern Cheyenne is often considered during this period as northwestern Colorado up into the southern Powder River Basin along the North Platte. They could also be found extending across the Powder River Basin clear to Montana as they freely intermingled with their allies, the Dakota. One of their favorite camping areas was along the headwaters of the Little Missouri in Crook and northern Campbell counties.

The Arapahoe during this time also overlapped territorially with the Cheyenne and Sioux. Their "core area" if such existed, seems to be mostly just west of the Cheyenne, ranging from eastern Colorado and southeastern Wyoming up around the Laramie Mountains and northern Laramie Basin. They were also found across the North Platte, and towards the Big Horn Mountains and into the southwestern Powder River Basin (see for example Trenholm 1970:3-51).

By this time the Snake has essentially been pushed back into the Wind River and Sweetwater River country of central Wyoming; the Kiowa and Kiowa-Apache, and the Comanche were well south of Wyoming. Any part of the Powder River Basin could be subjected to raids by almost any of the wide-ranging nomad tribes, including any of those just mentioned as well as the Blackfoot and Piegan and Pawnee. Such groups as the Crow definitely were living and raiding well into the study area.

However, the Shoshoni were not pushed as completely off the Plains as some authors would have us believe. In alternating hostility and alliance with the Crow, they made use of the westernmost Powder River Basin well into the 1800's. Apparently they had a resurgence of power after they defeated the Crow in a series of decisive battles in the Wind River Basin (see Cowrie 1957).

The Powder River Basin After A.D.1850

Tribal territories during this period remain much the same, however, the continuing encroachment of Euro-Americans concentrating along the North Platte begins to effectively drive a wedge below the southern Powder River Basin (Figure 12). The increasing flood of Oregon Trail immigrants of the gold fields in California and homesteads in places such as Oregon, the construction of the Union Pacific, all served to disrupt game movements and increase the frequencies of white-Indian encounters.

Groups of warriors entered this "corridor" to raid, trade, beg or steal but the effects on game populations lowered its value as a residential area for any of the Cheyenne, Sioux, and Arapaho bands. This increased the tendency for a cultural and geographical division between the northern and southern Cheyenne and Arapaho.

At somewhat later dates, routes to the Montana gold fields and points west were opened up through the western Powder River Basin. The Bozeman Trail and the series of forts along it is the best known example. All of these developments led to the inevitable conflicts with the Sioux and Cheyenne, and to the United States calvary campaigns that lead to the destruction of the last Plains Indian culture. Such developments are mentioned here in brief outline, as they relate to the geographical position of these various tribes. More detailed consideration of the placement and significance of strictly historic sites in a cultural resource inventory is found elsewhere.

First it is appropriate to reiterate that for all tribal "territories in all time periods, any discussion is only an approximation. Some groups had a central territory that was fairly well defined, for example the later control of the Black Hills and Powder River Basin by the Teton Dakota. However, all of these groups shifted constantly expanding in one direction then the other, and there was always a large degree of overlap. The Arapaho would be noted well north in the Powder River Basin one year, and a few years later their "main camp" would be located on a tributary of the South Platte in Colorado. Some northern Cheyenne camped consistently with the Sioux in southern Montana, and at any given time entire Sioux bands could be found living with the Southern Cheyenne. In the space of 4 or 5 generations the Kiowa moved from western Montana to Texas.

A Brief History

Before continuing, it might be appropriate to mention briefly historical developments concerning more directly Euro-American expansion into the Powder River basin, and culmination in the events after 1850.

Most early historical documentation of the Powder River Basin concerns the southern end and was centered at Fort Laramie. Later parties also began to push up the tributaries of the tributaries of the Yellowstone River into the northern end. The junction of the Laramie and North Platte Rivers was pleasant country, with well-wooded flood plains and good water, and nearby buffalo plains, backed by pine-covered hills and picturesque Laramie Peak. The Platte was the natural route to the west and the Laramie River area was a natural stopping place along it. After the Louisiana purchase of 1803, Americans began to expand up the Missouri and Platte to compete in fur-trapping and fur-trading with the French and Spaniards. The first historic note of the Laramie River-Platte junction was apparently by Robert Stuart, a member of John Jacob Astor's American Fur Company, in 1812. The area was visited by various fur trappers during the next several years, including the man called Laramie, who was to be murdered by the Arapaho in 1821 and who gave his name to a fort, a river, a mountain, a city, and a county. Also during the 1820's, mountain men such as Jedediah Smith and Thomas Fitzpatrick began to trap in western Wyoming and make their way back to Missouri via South Pass, the Sweetwater, and the North Platte. The potential of this route for midcontinental travel was later to be realized as the Oregon Trail, but for sixteen years this route was used to and from the famous mountains man's Green River Rendezvous. Others began to trap the beaver near the future site of Fort Laramie, in the "Black Hills" (as the Laramie Range was known then). Competition was fierce, even unscrupulous, between Astor's American Fur Company; the Rocky Mountain Fur Company of William Sublette and Robert Campbell, and others. In May of 1834, Sublette and Campbell founded Fort William, for trading on the Laramie (Hafen and Young 1938:29; all of the discussion of this section is abstracted from Hafen and Young 1938, Brown 1970, Coutant 1899, and

Larson 1965).

Fort William, later to be Fort Laramie, was ideally located for trade with the Arapaho, Cheyenne, and Sioux, especially the Brule and Oglala Sioux. The fort was able to weather the change from beaver trade to one more dependent on buffalo and other game, and the competition by several other trading posts later founded within a few miles of its location, as well as the debilitating affects of the whisky traded to the Indian nations by small independent traders (none of the larger traders were above trading the illegal spirits, until it began to affect even their own trade negatively). The Sioux clearly dominated the area as they came southward out of the Powder River Basin and Black Hills country, and formed the main part of the large village that could be found around the fort several times a year. Bands of over 2000 Oglala moving into trade were nothing unusual. Often several hundred lodges of Cheyenne and Minneconjous or other Sioux wintered at the fort A.J. Miller, an artist accompanying the English gentleman Sir William Drummond Stewart on a western expedition describes the fort as:

> ...of quadrangular form with block houses at diagonal corners to sweep the front in case of attack...
>
> Over the entrance is a large block house in which is placed a cannon... The Indians encamp in great numbers here 3 or 4 times a year, bringing

> peltries to be exchanged for dry goods, tobacco, beads and alcohol.
>
> The Indians have a mortal horror of the "big gun" which rests in the block house, as they have had experience of its prowess and witnessed the havoc produced by its loud "talk". They conceive it only to be asleep and have a wholesome dread of its being waked up.
>
> ...when this space is filled with Indians and traders...the scene is lively and interesting. They gather here from all quarters; from the Gila at the South, the Red River at the north, and the Columbia River west, each has its quota and representatives, Sioux, Bannocks, Crows, Snakes, Pend-Oreilles, Nez Perces, Cheyennes...all except the Blackfeet... (Hafen and Young 1938:46).

Clearly a wide variety of peoples used the fort and traveled down through the study area, although any sites they left are probably indistinguishable from those of Cheyenne and Sioux. Numerous accounts of early trappers, immigrants and other travelers record meeting thousands of Indians along the Platte just east of the Laramie junction, and all are reported as either Sioux or Cheyenne. Fort Laramie continued as a prosperous enterprise into the 1840's. when the first wagon trains of immigrants to California and Oregon began to filter into the area and trade at the fort (the first supposedly being a train of 80 wagons guided by Tom Fitzpatrick in early May, 1841). By this time the old wooden stockade had rotted and a new fort had been constructed of adobe. By 1844 over a thousand people a summer paused to repair and rest along the Laramie River. These were mostly families heading to new western homesteads and not yet the gold seekers (some trains averaged over five children per woman!). The Sioux remain the most remarked group during this time period. They continued to bring in thousands of buffalo robes, tons of jerky, and much in the way of moccasins and other items of native manufacture. They are noted as fighting other groups on several fronts, including the Snake and Pawnee, and stole horses from white travelers but otherwise were not yet so hostile. The Crow often plundered smaller parties as they left the Platte area.

During the same early historical period the Portuguese houses or "Fort Antonio", also a historic cultural resource in Powder River Basin was, involved with the Plains tribes in the early 1800's. References to this trading post are difficult to find; texts specifically on Wyoming history published from 1899 to the present usually omit any mention of it, although it was one of the first permanent structures in Wyoming. The date is usually given as 1834, the same year as the founding of Fort William (United States Park Service n.d.; see also Russell 1921; Raynolds 1868; and Hafen 1965).

Antonio Montero was a trapper first noted as an employee of the American Fur Company at the Green River

Rendezvous in 1833. The following year he was employed by Captain Benjamin Bonneville to lead a group of trappers into Crow Indian country, and set up trading arrangements with them. Montero wintered on the Powder River and built a substantial stockade and set up buildings. He operated this post for four years, while being harrassed from all sides. The Sioux beseiged the fort, the Blackfeet stole horses, but apparently the greatest problems came at the instigation of other fur companies, the most notable handiwork being the mischief of Jim Bridger. The post was abandoned in 1838, and after a few years more, the name of Montero drops from historic accounts of the era.

During the 1840's the United States government became increasingly concerned with the western reaches and the flow of traffic through them. Expeditions such as that of Fremont and others were launched for exploratory reasons and as a show of force to the Indian tribes. The Sioux were becoming increasingly annoyed at the growing tide of wagons and increasingly insolent and less friendly. The government began building a series of posts up the Platte River route, and reached the Laramie River to begin constructing the military post of Fort Laramie in 1849. It was to be the main post in the coming battle for the western Plains.

The reports of gold in California began to accumulate in the same summer and the movement of hundreds of wagons in a summer jumped to an incredible total of hundreds a day. Around 20 to 40,000 people were on the move, dead oxen and broken wagons lined the Platte Valley for miles. The grass was grazed to nothing for miles on either side of the Platte, driving the game away. By this time, the early 1850's, the fur trade market had decreased to almost nothing, and the Sioux had pulled back to the north and many Cheyenne to the south.

In an attempt to maintain relations with the Indians, the great Fort Laramie Treaty Council of September, 1851 was called. Such a show of the Plains Horse Indian was never to be seen again. Under the promise of protection the tribes rode in, the warriors in front decked out with weapons and finery, the women and baggage following, and the dust they raised was seen long before the people arrived. Over 10,000 gathered - the Sioux, Cheyennes, Arapahos, Crow, Assiniboin, Gros Ventres, Mandans, Arikaras and Snake. The Brule and Oglala Dakota and Cheyenne were the most numerous. The thousands of horses caused an immediate shortage of grass and the treaty site had to be moved down the North Platte thirty-six miles to the mouth of Horse Creek. The government recognized the destruction caused by immigrants along the Platte and promised restitution if the Indians would promise to refrain from any retaliations, and with much promising of good will and peace a treaty was signed to this effect. In it tribal territories were assigned, - the Sioux were to have the eastern Powder River Basin, roughly divided by a diagonal reaching from the present site of Casper, Wyoming to the Black Hills and beyond. The Crow were to have the country west of the Powder River, and the Cheyenne and Arapaho the country from the North Platte down to the Arkansas River of Southern Colorado. This created a buffer zone in effect, between the Powder River and Belle Fourche Rivers. It was ignored from the start by both Crow and Sioux, of course, but then the whole "great peace" of 1851 didn't last two years altogether.

Hostilities began by 1853, when three Mininconjou were killed during an attempt to arrest one of their band. In 1854 a similar incident began over the killing of a Mormon cow. Young Lt. L. Grattan was eager to distinguish himself and did so, by starting a fight in the middle of a large Sioux village and ending up with 24 arrows in his body and all 29 of his men dead and mutilated. Other hostilities began and in September, General Harney replied with the massacre of Little Thunder's band of Brule' Sioux near Ash Hollow, Nebraska, 6 miles north of the Platte.

During this same time, Ft. Laramie became the headquarters for the hunting expedition of Sir George Gore, an Irish nobleman who brought wagons, carts, 112 horses, 14 dogs, and 40 servants, including a gun smith and one to tie flies for his fishing. He spent some 2 years killing 40 grizzly bears, 2500 buffalo, and other game. One of his expeditions, all of which were guided by Jim Bridger, went up into the Powder River Basin and along the Powder and Tongue rivers. His friendship with Bridger and the contrasts this presented are famous in Western annals, including his reading of Shakespare, which Bridger "recin'd was to highfalutin" for him.

Immigrants continued to pour through central Wyoming to the number sometimes of 30 or 40,000 people a year. The land promised to the Cheyenne and Arapaho south of the Platte was flooded during the Colorado gold rush and cities, roads, and ranches sprang up. "Colonel" Chivington's massacre of Black Kettle's Cheyenne at Sand Creek in 1864 was one of several incidents that concern us here because Cheyenne and Sioux reprisals along the South Platte, including the burning of Julesburg, lead to the exodus of several thousand southern Cheyenne and Arapaho and Sioux into the Powder River Basin to join their northern cousins. Over 8000 Sioux and Cheyenne were camped along the Powder River, then along the Tongue River at the foot of the Big Horns in 1865. Confident of their power, and angered by the incidents to the south, they decided to strike out against the increasing number of soldiers and civilians to sell the Black Hills, to lend the Black Hills to the United States until the gold was gone, or to give the United States the Powder River Basin. The treaty commission returned to Washington in failure, and a large military expedition was set into action to punish the Sioux and Cheyenne for not selling the Black Hills (the rubric for launching the expedition was to bring in the "hostiles" who would not live on the white man's handouts at the reservation agencies as they were supposed to).

In February, 1876 General Crook marched into the Powder River country to enforce the government order. On March 17, the advance column under Col. Reynolds attacked the sleeping camp of Two Moon's Cheyenne and Low Dog's Oglala, drove them from it, and destroyed the village. Reynolds was later court-martialed for allowing the Indians to steal back their 1500 horses that night. They fled to the village of Crazy Horse near the northern Black Hills. Later they moved north to the mouth of the Tongue where Sitting Bull's Hunkpapas were located, then drifted towards Rosebud Creek. With the approach of summer, 1876, three armies were sent into the Powder River Basin to force the "hostiles" onto the reservation. General George Crook was to approach from the south, along the old Bozeman route, Col. John Gibbon from the west, and General Alfred H. Terry from the east. With Terry was Lt. Col. George A. Custer and his Seventh Calvary Regiment.

The outcome of this expedition of three columns of bluecoats are well known. On June 17, 1876 General Crook's forces were stopped at the "Battle Where the Cheyenne Girl Save Her Brother" (The Battle of the Rosebud). The Indians shifted west to the Greasy Grass (Little Big Horn) where eventually 10,000 people were camped for 3 miles along the watercourse. On June 25, 1876, Custer divided his force and attacked the large camp. The Indians checked Maj. Reno and Capt. Benteen and pinned them down, then turned their full fury on the rest of Custer's command, killing all 286. They fought Reno the next day, then broke camp and left before the imminent arrival of the forces of General Terry. Having expended most of their ammunition, the Sioux and Cheyenne scattered, up into the Big Horns and all across the Powder River Basin.

The military columns were then reinforced and began to prowl the Powder River country, looking for the hostiles. Several decisive battles were fought, including the destruction of Americans Horse's village of Oglalas and Minneconjous and Dull Knive's Cheyenne. All during the fall and winter, in Sitting Bull's words, the Sioux were "running up and down this country, but they followed us from one place to another". Eventually Sitting Bull fled into Canada and Crazy Horse's starving band of 900 Oglala surrendered at Fort Robinson. The United States Government took the Black

Hills and Powder River Basin and forced the Sioux eastward into the barren lands of South Dakota, onto an ever smaller and smaller reservation. The power of the Powder River tribes was broken.

Plains Indian Culture

The following is a brief, generalized account of several aspects of Plains Indian culture. Its purpose is to add information of this sort to previous discussion which has been more strictly ecologically and historically oriented. As with all previous discussion, it is also presented to summarize data which should be useful to considerations of the types of sites left by these groups, the material items likely to be found in them, and their location. Most of the treatment in this section will concentrate on the culture of the classic Plains equestrian buffalo hunter, the horse nomad tribes that have come to symbolize the American Indian. The discussion here is thus most relevant for the Powder River Basin for the 200 year period from A.D.1680 to A.D.1880. When it seems more relevant, consideration is given to pedestrian hunters from the 200 years previous to this, but most such discussion is relegated to archaeological sections of this report.

The following discussion is abstracted from several useful sources including Lowie (1954, 1935) Grinnell (1972) Spencer and Jennings (1965) and others.

Language Affiliation

The several waves of migration which have been mentioned resulted in several main language blocks being in the Powder River area. A hierarchical classification of some 200 North American Indian languages has been derived and refined by anthropologists and other students of Indian culture over the past 100 years. Basically, each of the separate Languages below are mutually unintelligible. This is not always so when the split has been within the last few hundred years and the Crow and Hidatsa, for example, share a large number of similar words that are mutually understandable. The Language Families listed imply a split sometime much farther in the past, but basic vocabulary, sound systems, and grammatical structure remain similar enough that a trained linguist can classify these languages as related and in the same family beyond any doubt. Differences of the Language Phylum level imply splitting of peoples and separate evolution of language for perhaps as long as people have been in North America, or they might represent several different migrations into the New World by peoples who were already speaking different languages. In any case, there is essentially no discernable relationship between the languages of different phyla. Tribes once resident in the Powder River Basin are marked (*).

		Tribal Language	
Language Phylum	Language Family	Nomadic Bison Hunters	Sedentary Village Agriculturists
I.Macro-Algonkin	Algonkin	Plains Cree	
		Plains Ojibwa	
		Blackfoot	
		Atsina	
		*Cheyenne	
		*Arapaho	
II.Macro-Souian	Souian	Assiniboine	Mandan
		*Teton Dakota	Hidatsa
		(Yankton)	Ponca
		(Yanktonai)	Omaha
		(Santee)	Iowa
		*Crow	Oto
			Missouri
			Kansa
			Osage
	Caddoan	(Pawnee)	Pawnee
			Arikara
			Wichita
III.Na-Dene	Athapaskan	Sarsi	
		*Kiowa Apache	
		*Lipan Apache	
IV.Aztec-Tanoan	Kiowa-Tanoan	*Kiowa	
	Uto-Aztecan	*Wind River Shoshoni	
		Comanche	

Population Estimates

The following information is abstracted from Kroeber (1939) and represents his estimates of Plains aboriginal population in an idealized, pre-contact situation around A.D.1780-1800. Populations had grown much higher in the Powder River Basin tribes by the time of the extensive United States military campaigns. However, allowing for groups in other areas (the Southern Cheyenne and Arapaho, the Crow far west along the Yellowstone River, etc.) and for groups living around reservation agencies at an early date, the totals for the appropriate groups listed below are not far from the Powder River Basin populations of the late Historic era. The first four groups are the predominate Powder River tribes during this later time, and other nomadic Plains groups are listed for comparative purposes.

Tribe	Population	Tribal Area (km^2)	Population Density ($1/100km^2$)
Crow	4000	152,700	2.61
Cheyenne and Arapaho	6500	211,100	3.07
Teton Dakota	10,000	170,000	5.88
Assiniboine	10,000	171,400	5.72
Plains Cree	3,000	156,700	1.91
Blackfoot	15,000	346,400	4.33
Plains Ojibwa	2,000	47,000	4.25
Atsina	3,000	81,400	3.68
Sarsi	700	93,700	0.75
Kiowa and Kiowa Apache	2,300	168,200	1.36
Wind River Shoshoni	2,500	55,000	4.54

Material Culture

The industries of the Plains Indian were of a basic nature and were in the main oriented towards manufacturing the clothing, weapons and other items needed to survive on the grasslands. This also meant that all technology had to be portable, and, in later decades when hostilities increased, it had to be "rapidly portable". The materials used were those natural materials available - stone, later replaced by metal, bone, antler, wood, and especially leather and rawhide. This is not to say that items of material culture were few and simple. Hundreds of separate items existed - tools, adornment, everything from specially carved bone devices for flattening the porcupine quills used in decoration, to hair brushes. As time went on Plains material culture was becoming increasingly complex and highly decorated. The acquisition of the horse allowed transportation of hundreds more pounds of baggage, and resulted as well in dozens more items for outfitting and caring for the horse. A few are mentioned here that in a general fashion reflect the life-way of the Plains nomad.

There was a basic sexual division of labor in Plains economy and in manufacturing and using the technology on which it was based. Men made the weapons for the hunt and for war, while women made many of the tools used in processing game into food, clothing and shelter. Before the gun came into general use, manufacture of the bow and arrow reached a high state of the art. The simple self-bow of juniper was often nicely fashioned, but this gave way to a sinew-backed bow among most tribes. Double-curved, compound bows of mountain sheep horn or elk horn backed with sinew were beautifully smoothed and decorated with carving, and had a range between 400 and 500 yards.

Grinnell (1972:172-176) describes the making of a Cheyenne bow of rams horn that involved a whole series of steps - cutting and trimming the horn, continuous boiling and fine shaping, gluing and treating and backing, and finally polishing and applying a white coating of burnt gypsum. Manufacture of such a bow could take over 3 months, and finely decorated bow cases and quivers of otter skin or rattlesnake skin, and arm guards of thick leather or carved bone were but part of the gear. Before replacement by sheet iron points, arrow points were of chipped stone, and each sharp, thin point of colorful stone was perfectly symmetrical and aesthetic as well as functional. A set of proportions for length and thickness of shaft, size of arrowhead, and placement and length of feathering were known and used to give the arrow the desired balance. Ways of shaping the shaft, the behavior of arrows after they struck, all were common subjects of conversation around camp fires. Old men with extra skill could become specialists who bartered their arrows to others, especially among the Cheyenne, and their skill was widely respected.

War clubs had stone heads ground to shape, a long thin shaft and a strap for the wrist, and were a deadly weapon in hand-to-hand combat. The small round shield of thick bull hide was functional as well as decorative. Earlier, larger shields provided adequate protection from a barrage of arrows. In later times the shields and its cover were highly decorated with symbols indicating its importance as a repository of the owner's special powers. Several complete styles of fighting and weaponry are almost lost to us, existing only in the earliest Spanish New World documents and the recollections of men very old when the first white men came into the northern Plains. Pitched battles involving hundreds of warriors on foot were replaced by calvary with thick quilted armor, armored horses, and long slender lances; the Comanche favored tipping their lances with sharpened segments of Spanish sabers. In the full horse and gun pattern lances were retained as ceremonial items. The full horse and gun pattern was only the latest and best known of a long tradition of intertribal warfare (see Secoy 1953).

Plains women are noted for their hidework, ranging from the absolutely white ceremonial deerskin of the Kutenai to the fancy dresses decorated with colored fringes, beadwork, porcupine quills and hundreds of elk teeth, and to the large tipis using up to 20 to 30 buffalo hides. A series of stone scrapers (often hafted in an L-shaped antler handle) bone and metal fleshers and numerous other tools served in this hide work. The tipi more than anything else is perhaps the "artifact of the Plains". These conical skin tents could be up to 20 feet high and 20 feet in diameter, and also came to be painted in colorful fashion. The Crow were known for cutting poles over 30 feet long, giving the whole shelter a large hour-glass effect, with long strips of red cloth to the top of each pole to flutter in the wind. There are several ways to lay a pole foundation and apply the other poles, and if not done exactly right the whole mass can collapse (the writer once aided a friend in setting up his tipi for a 4 month field camp; for the first time his wife was not along but we were confident and for 4 months he lived in a tipi that was extremely comfortable but noticeably lop-sided).

The tipi was completely adapted to the western Plains with a series of special features, and for spacious living in such an environment it cannot be matched. The conical shape does not catch the wind and stakes, circles of rock and even a thick anchor rope from the juncture of the poles down to a large stake in the center of the floor can keep it solid in Plains "spring breezes". The door is raised off the ground and the sand and dust blowing along the ground will slip on by without entering the tent. Long thin poles fit into large vent flaps at the top, and these can be used to catch the slightest breeze on a hot summer day and direct it down through the tent, or to close the vent completely and make it water tight. Also in the summer the sides could be rolled up to turn the tent into an airy shade, and in the winter hide, curtain-like liners were dropped down around the inside of the tent and filled with hay. With this insulation and perhaps a small fence around the outside to catch drifting snow, the tent was completely inhabitable in the most extreme of arctic conditions.

Society

Marriage and the Family

The nuclear or extended family was the basis of Plains society. Romance and courtship were important to young people and carried on in a variety of stylized ways and places - playing the flute outside a sweetheart's tipi in the early evening or arranging to be by the path to firewood or water at the right time. An ideal rule of residence with the husband's father's group after marriage (postmarital patrilocal residence) was expressed among the Blackfoot, Cheyenne and others while the opposite view (matrilocal residence) was expressed among the Cheyenne and Arapaho, and the Crow usually seemed indifferent. All groups on the Plains were shifting to a patri-biased but very flexible kinship system that was seemingly the most appropriate for that mode of existence. Usually a bride price was offered in the form of horses, arrows, and other objects, but some groups had an exchange of gifts or a period of "bride service", where the young husband resided with the wife's parents for a few years and aided them. In the warlike Plains tribes the surplus ratio of women made polygamy common, and the taking of an extra wife captured from an enemy tribe was also not at all infrequent.

Levels of Organization

Groups of families were usually included in more encompassing kinship units that were clan-like, recognizing their descent from a common line. Several tribes that were previously Missouri River agriculturists (e.g. Crow and Cheyenne) had such units organized after a matrilineal fashion. As with the basis for residence and reckoning marriage eligibility, most seemed to be developing a patrilineal bias as time went on.

Such a kinship unit once formed the core of a "band", the local group that was together much of the year. As populations grew, bands enlarged and split eventually including a number of kinship units and their basis became use of a common territory rather than solely kinship. Such local groups varied greatly in size but initially clustered around 100 to 200 people. These bands could fragment into smaller units under certain conditions of season, topography and resource availability and would tend to divide along the lines of these clusters of related families.

The Teton Dakota are generally thought of as having seven main bands, the Brule (Burnt Thighs), Hunkpapa, Miniconjou, Oglala, Oohenonpa (Two Kettle), Sans Arc, and Sihapsa (Blackfoot Sioux). Of these the Oglala were by far the most numerous and in later periods were divided into several groups, such as the 900 "hostiles" lead by Crazy Horse in the 1870's. The Cheyenne historically had at least 10 main tribal subdivisions; the Ivistsinipa (Closed Gullet), Oivimana (Scabby Horses), Hevatamu (Hair Rope People), Isiometanu (Hill People), Wutapu (Eaters), Hofnowa (Poor People), Oktona (Long Jaws), Masikota (Lyers on the Left Side), Omisis (Eaters), and the Sutai (once a separate tribe). The Crow had 13 main subdivisions, which did approximate matrilineal clans, the Acirario (Newly Made Lodges), Acitsite (Thick Lodges), the Acioce (Sore-Lip Lodge), Uwatace (Greasy Mouths), Usawatsia (Without-shooting-they-bring-game), Xuxhaxatse (Tied-in-a-knot), Acepenuce (Filth-eating Lodge), Erarapio (Kicked-in-their Bellies), Ackyapkawia (Bad War Honors), Birikyoce (Whistling Water), Acxatse (Streaked Lodge) and Ackyamne (Piegan Lodge), Acbatcua (Treacherous Lodge). All of these represent only the latest named segments of a social order that had been constantly expanding and adding new names.

The seasonal aggregation and dispersion mentioned above, and discussed in the first section of this report, often brought the whole tribe together in the famous summer camp circle of the Plains Indian. Each group had a certain position in a circle of several thousand tipis, with large ceremonial and council tipis toward the center and an opening to one side. All of the northern Cheyenne and Arapaho might be found in such a circle, or each local groups of a large tribal segment, such as the traditional summer encampment of all the Oglala. Encampments of this size were not possible without the wide-ranging hunting of hundreds of young mounted hunters.

Warrior Societies

A tribal society is marked by crosscutting "sodalites" that tie the fiber of society together. Kinship and other relationships in a band society simply get more diffuse as they extend farther into other groups. Sodalities in tribal society are different, and represent organizations found in all groups no matter their distance. In Plains society an increasingly complex set of warrior societies and women's crafts guilds added cohesiveness to the bonds within the ethnic group.

Each of these were associated with a series of rituals and stylized behavior, of public aspect and private secret rituals known only to the members. All had general functions which groups took turns fulfilling, and specific functions which the group was noted for. The Pawnee had a society of single women and old widows noted for dressing shabby on the occasion when they performed their service--torturing war prisoners. The Cheyenne "Dog Soldiers" (Hotamitanu) were the most war-like of the soldier bands; from their initial function as a "police-like" organization which enforced the orders of the tribal council, they grew to a force of young, aggressive warriors who could contradict and offset the more conservative power of the old men of the tribal council. Policing camp moves and, especially, the cooperative buffalo hunts was a common function shared by all warrior societies, and one of the few instances when any Plains organization had a true authority over other people.

All such societies were marked by special regalia and behavior. The Oglala "Kit Fox" Society members wore kit fox fur necklaces, a head band decorated with kit fox jaws and a special arrangement of crow and eagle feathers on the back; officers painted their bodies yellow, while the 4 main officers led the group through camp carrying the ceremonial lances during the public part of their ritual. The Kit Fox Society vowed not to retreat in battle, as did many of these groups. The Dog Soldiers carried a long red-painted pin with an attached ornamented rope, and during a battle they would place the pin in the ground and attach the rope to their belt or around the shoulder; they could not then remove the pin without being branded a coward for life, and would die on that spot unless a friend could pull the pin and use his quirt to literally drive the Dog Soldier back. The Oglala Heyoka (Contrary) Society and the less structured Cheyenne "Contrary" braves are examples of a respected class of well-known warriors who were required to do everything "backwards". They would come into a lodge an be sure to sit on the ground next to the bed, they were often seen riding a horse backwards, and on coming home were often known to wash their hands in boiling water while complaining it was too cold.

Political Structure

Here was another phenomena that was growing increasingly complex and structurally defined as tribal culture evolved on the Plains. Underlying all Plains political systems was the egalitarian ideal common to most band and tribal societies. Chiefs were charismatic, respected for personality, wisdom and generosity and generally had no true power over any followers but only gave advice and suggestions. Simply packing up and moving to another local group was an option open to any man who became involved in a dispute over a course of action.

The band as a cooperative body could act to punish a true offender such as a murderer, and social ostracism and ridicule was a very strong and effective deterrent to more minor offenders. Warrior societies through the years gained true policing authority, especially in situations where the good of the whole group was at stake. A man who had disrupted a communal hunt by sneaking out and starting early could find himself clubbed senseless by a warrior society with all his horses gone and his tipi and other belongings cut into shreds by the rest of the band.

Warfare with the other tribes and with the white man intensified these patterns and added to the power of the warrior societies and military leaders. In some cases a true "war chief" evolved who augmented the power of the band chief or even replaced him. The rise in importance of Gall, war chief for Sitting Bull of the Hunkpapa Sioux is an example. Finally, we might mention the Tribal Council of the Cheyenne, which was in many respects the highest development and most complex political structure among the horse nomads. Here there were 44 chiefs, 4 from each of ten bands and 4 principle chiefs. These served for certain terms and gathered, met, debated and voted in certain highly stylized ways. Although still fairly charismatic in relationship to their own bands, the decision of the council could be strictly enforced by the Dog Soldiers in later years.

Ceremonial Activity

All aspects of Plains Indian life was inexorably tied up with concern with the spirit world. The intricate detail of daily ritual, of society ritual, of the various shamans, healers, and prophets, and all the hundreds of bits of ritual parephenalia cannot even be satisfactorally mentioned within the limitations of this report. Two ceremonial complexes are well known and usually mentioned in any consideration of Plains Indian ceremonialism - - the guardian spirit complex and the great tribal Sun Dance. Every male upon reaching puberty was instructed by a shaman in the necessary ritual and conduct and, after much fasting and purification in sweat baths, he found a high, isolated spot where fasting and self torture led to a supernatural vision. If successful, he communicated with a supernatural being who became his guardian spirit for life, and told him what ritual objects to collect for his personal "medicine bundle" to symbolize this power. These visions were of varying complexity, the best account probably being that of Black Eagle, an famous Oglala shaman who encountered hundreds of supernatural beings, dancing horses and rainbows in the sky, visited several supernatural worlds, and so on. The vision of Two-Leggings, a Crow Indian, revealed to him that thousands of white men with strange "white-faced buffalo" would cover the Plains, and the Crow must align themselves with these white men if they were to retain any part of their hunting grounds.

The Sun Dance of the Powder River Tribes, especially Dakota, Cheyenne, and Arapaho, were the most complex. The ceremony was held at the largest tribal gathering, usually in mid-summer, lasting for a number of days. Several important shamans would be involved in instructing and preparing the men who had vowed to undertake the Sun Dance. They also oversaw selection and preparation of the large, sacred central pole and construction of a large circular, partially roofed dance lodge around this. The ceremony was an expression of tribal solidarity; here also the complex ritual, feasts, processions through camp, dances, mock battles, stylized singing groups, sexual promiscuity, and other ritual which cannot be described in detail here (the reader is referred to any of the references cited in the beginning of this section). The more individual purposes of the men who had vowed the Sun Dance might involve a request for supernatural aid in curing a relative, or be due to instructions received in a vision. The self-torture of these individuals has been the most publicized aspect of the Sun Dance, where bone skewers pushed through the muscles of breast or back were attacked with a thong to the central poles or to several buffalo skulls, and the vower wrenched and pulled against these during the dance until the skewers were torn loose.

A Preliminary Discussion of Site Characteristics

The following section discusses some expectations concerning the basic characteristics of cultural resources that might have been left by the Powder River Basin Plains Indian tribes. The reader is asked to remember, first, that this is only a preliminary discussion, second, only very basic characteristics are considered in an attempt to avoid dwelling overlong on subjects more adequately treated in archaeological sections.

A great deal of insight into the nature of archaeological data can be gained whenever there is some historical documentation, and this insight can allude to essentially any aspect of the cultures now gone. However, there are significant differences in pre-horse and post-horse cultures, for instance, and it is a mistake any time to limit possible interpretations to only those that can be gathered from ethnographic analogy. The ideas and data presented to this point would allow us to generate hypotheses concerning the distribution of lithic materials from different quarry sites, the distribution of different stylistic attributes on projectile points, the organization and complexity of features in buffalo jumps, and on and on, all based on the known movements of tribal groups and the social changes they underwent. These are not dealt with here in this brief consideration of site sizes, numbers, types and locations.

Site Numbers

A series of arguments were outlined in the cultural ecology sections that appear to demonstrate an especially close and causal connection between effective moisture, shortgrass productivity, buffalo population, and cultural systems in the Powder River Basin. Without buffalo populations well above average, cultural systems used grassland areas only as an extension of a seasonal strategy based on environmental zonation in uplifted areas. For this kind of "Archaic" strategy, the plains along mountain fronts are much less productive than interior basin areas such as the Red Desert, which may appear more marginal to us today when in actuality they are not. With a generalized gathering-hunting subsistence, areas of extensive grassland are almost worthless. Furthermore, it does not matter what kind of resources are available for most of the year winter is the "critical period", the "limiting factor" on the Northwestern Plains that determines what population levels will be attained. You can eat buffalo steak all summer but if you starve to death in the winter there will be no one there the next summer!.

From these and other factors, we can assume that large populations making extensive use of grassland areas such as the Powder River Basin were critically dependent on killing sufficient buffalo to provide large winter stores of dried meat, jerky and pemmican. Conversely, any time we can document a significant upswing in effective moisture we can propose the potential for higher population and higher cultural development. We know the time period of concern here started with such an increase in buffalo populations (by a factor of 2 to 4) in the "Little Ice Age". The results are known historically in this case and give us a meter-stick to examine the correlation between environment and cultural adaptation. An episode of about 300 years duration was sufficient to encourage migration from every area bordering the Plains and rapid population increases on the Plains (see e.g. Secoy 1953:8-9). This led to competition, large pitched battles and never ceasing raids, and eventually to the spectacular Plains Indian florescence that has come to symbolize the American aborigine. It should be noted that without the high populations in adjacent areas that could donate large number of people, the developments would not have been so singular.

There is little doubt then that in the Powder River Basin we are dealing with increasing numbers of people through time, in the time period roughly A.D.1400 to 1880 we would expect significant increases in site numbers towards the end of this period. Eventually, the encroachment of Euro-American culture along the North Platte and Missouri river systems "compressed" these populations into the Powder River Basin-Black Hills area, leading to even higher densities. By the 1860's and 70's something like 20,000 tribal people were using this area. The Powder River Basin thus incorporates somewhere in its sediments the largest number and highest density of Plains Indian cultural resources in the United States. They also are the latest in time, the last bastion of Plains Indian cultures to be exterminated by the United States military. It follows that in terms of amount of information and historic importance, these resources are the most significant in the Plains.

Site Sizes

Concomitant to the increasing numbers of people was an increase in local group size. During the late Late Prehistoric the aggregation of perhaps 200 people at the buffalo jump was the largest social body during the seasonal round. At other times of year these people were dispersed into smaller groups, ranging from 50 to 75 people down to a simple family unit. With the advent of the horse group size increased drastically. Seasonal dispersion into smaller groups was still the norm and although there was considerable overlap in site size with latter periods, the basic local group was probably larger in later decades. On the other end of the scale, the nomads of later times were able to aggregate into summer camps with thousands of people (references to group sizes ranging from 200 to 300 up to 5,000 and 10,000 are common in the literature, e.g. Lowie 935:xiii; Ewers 1955:155; Grinnell 1972:288; Floyd 1804:64; Secoy 1953: 60, 64).

Thus we expect an increase in site size through time. By the 1800's sites with several thousand people were common and apparently camps of less than 500 people were infrequent. The Powder River Basin camps that gathered during the final military episodes were probably the largest groups ever assembled on the Plains. During much of the 50 to 75 years of this episode the location of most groups is not even known. Such camps would be diffuse, scattered over hundreds of acres, and thus of low visibility. Even if rocks were not used around lodges to produce the more visible "tipi ring", such a site would still have thousands of hearths and other recognizable features. The amount of debris left by 500 or 1000 or 5000 people over a period of two weeks is tremendous. Multiply this by 10,000 people over 200 or 300 years ang the results are staggering. The camp of 8000 or 10,000 people at the 1851 Fort Laramie Treaty council is not directly comparable since it was not a typical domestic camp, but within 5 days it turned several square miles into a barren, blowing dust bowl and the stench from accumulated camp refuse forced the U.S. Calvary escort to move 2 miles downstream (Hafen and Young 1938:

194). Somewhere scattered out across the Powder River Basin then are camps whose size and anthropological content are the most significant on the Plains.

Site Types

The discussion to this point has concentrated on camp sites, and noted an expected range from very small to very large. Ultimately the archaeologist must also be concerned with seasonal variation of these camps, for a winter camp is very different than a summer camp in terms of size, location, organization, features and artifacts. These are but one type site left by these cultural systems, although probably the most important in later times.

From about A.D.1400 to 1650 the buffalo jump was the largest and most spectacular site. A number of these have been found, usually closer to the Big Horns and Black Hills, but their existence in the central basin cannot be ruled out. Pounds based on natural topographic traps or constructed corrals are even more likely along the stream valleys and rougher topography of the central basin. When they occur, kill sites probably offer more cultural information than any other site. Parameters of seasonality, group size, group organization, associated territory and others can be reconstructed from the materials preserved in these highly significant sites. Kills using the horse are likely to be strung out and scattered for some distance, as the buffalo were "run", shot down one by one and then butchered and transported back to camp. Also, these kills would more frequently be in flatter, more exposed locations where bones would be less likely to be preserved.

Surrounding any camp in any time period, out to a range of a 3 or 4 miles, are "limited activity" sites representing the wild plant gathering and processing activities of women. These can range from no evidence to a fairly substantial accumulation of lithic cutting tools, chopping, pounding, and grinding tools, and some hearth features. They too provide information regarding these cultural systems and cannot be ignored.

In other cultures dependent on storage, for example the Eskimo, meat storage caches are a common site type. They are found in isolated locales or as a common feature in winter camps. These generally consist of a large cairn of rocks (which could be constructed to provide adequate protection even from bears) or a system of lined, excavated pits. Such features are expected on the Plains and especially before the horse made feasible the transport of several hundred pounds of meat products. The writer suspects that many of these features have been found, but not recognized by Plains archaeologists, and lumped under a general "stone pile" heading.

A series of ceremonial sites also expected for Plains Indian cultures range from the isolated vision quest sites to the large Sun Dance lodge complex. Sites such as the latter have not been found, to the writers knowledge, but several dozen could exist in the Powder River Basin. They will usually be found in association with large camps, and should present a very recognizable complex of post holes and other features when found. Isolated low walls, engimatic stone piles, and other such features have been found by archaeologists on the Plains, on high buttes and cliffs and categorized as vision quest sites, probably rightly so. Some of these, however were probably lookout stations used by hunters searching for game herds.

Site Locations

All of this topic is more appropriately dealt with in archaeo-environmental sections of the report, but let us mention a few possible generalizations based on the discussion to this point. First, any potential variation in buffalo density that can be documented is bound to be informative regarding site location and site numbers. Research in grassland ecology would be directly relevant to a predictive model. Any area where the "critical density" of bison numbers could be exceeded more frequently would have a higher probability of kill sites and nearby campsites. This might include situations such as any grassy basin-like locale with good soils that would attract buffalo (and might also serve as a feasible gathering area for kill operations). Any locale that tended to be part of a migration route, either seasonal movement within an area or year-to-year movement between larger areas, would raise buffalo densities above the average for the area and be more subjected to hunting. Any locale that provided timbered canyons, slopes or river bottoms for winter shelter, adjacent to good grass for winter forage, would attract buffalo populations consistently and thus also the hunters of the buffalo.

It was also noted that fairly heavy predation could reduce local game populations below the level where they could be effectively hunted, forcing aboriginal groups to move. Any area then that would combine some of the above features with an ability to attract buffalo back in shorter time should have high site frequencies. We might envision a situation where hunting by a large Plains camp exhausted the game around the Pumpkin Buttes area (south of Gillette). Supposed then there is a normal tendency for Bison to filter out into the open grasslands along river valleys, which would begin to bring buffalo back into this area along three major river systems, the Cheyenne, the Belle Fourche and the Powder Rivers. The Pumpkin Buttes area then might have had an exceptional ability to recover from intense predation, back to near carrying capacity, in two or three years. The original group or some other might then have been attracted back to the headwaters of these three rivers time after time.

There would likely be some distinction between early and later camps in the Powder River Basin because of the increasing dependence on hunting. Earlier sites might be closer to uplifted areas, and more likely in areas of topographic and vegetative diversity. To a group still highly dependent on plant foods, it is actually better to camp where the grassland communities are adjacent to areas of extensive badlands, sandstone scarps, and so on. In certain seasons and for certain kinds of plant foods, badlands are the most productive area. For groups highly dependent on hunting such badlands are merely a patch of topography of extremely low game density and there would be an increasing tendency to camp well away from such areas. We might also assume that through time, from 1400 to 1880, there was an tendency to use the surrounding mountains less and less. Through time then we might expect to find more of the yearly settlement system and more types of sites out in basin areas.

One tendency that is clearly remarked in all ethnographic accounts is the location of the main camps on river floodplains (see references in last section, below). Towards the end of the Plains cultural florescence, the forage and water needs of the huge horse herds were increaseingly a factor in locating these large camps on the main streams. References thus are to camps on the Powder River, Tongue River, Cheyenne River and the North Platte, and on streams such as the Rosebud and Little Big Horn. There was also sometimes a tendency to camp farther down river, nearer the mouth of these watercourses where they joined yet larger flows. However, even in the latest decades the Plains tribes were often split and dispersed all about the Powder River Basin; they must have been on all the most minor tributaries, wherever good water was to be had. Whole expeditions of United States Calvary prowled the area for years, never really finding the villages except by accident and as a great surprise to both parties. This was when we know there had to be 20 or 30 villages out there.

Before the horse, the same pattern of camping on river bottoms is likely whenever possible. These people, too, would have sometimes scattered out along very minor tributaries, especially as populations rose and their territories were more finely exploited. The limited range of pedestrian hunters forced them to move more to keep track of the herds, and thus in earlier periods we can expect some camps out on dryland areas away from any water. Early Spanish accounts of Plains Apache hunters who had only the dog for transport clearly document this need to "follow the buffalo" (e.g. Wedel 1963:11). With the horse each camp always had several dozens of young hunters ranging out 50 miles or even more in all directions.

All of these hunters were compelled to seek shelter in the winter, just as the buffalo were. Thus we expect horse nomad camps from other seasons along streams almost any place, and pedestrian hunter camps along rivers but at points where they could also exploit some diversity of vegetation, but we expect all winter camps to be in the most heavily timbered river bottoms; all of these together point to the river floodplain as having the highest density of sites.

Conclusions

The conclusions to the above discussion are obvious. The Powder River Basin, including Campbell and northern Converse counties, incorporates the largest and most significant block of Plains Indian cultural resources in the entire western Plains. Numerous kill sites exist which are typical of buffalo jumps on the Plains and at least one, the Vore Site, represents the killing of 25,000 buffalo and there may be no site that can compare to it. Several of these kill sites throughout Wyoming are brought to the attention of archaeologists every year, and undoubtedly they will continue to be found in the Powder River Basin as well.

Campsites are more representative of this potential significance. In the Powder River Basin we expect an increase in number and size leading up to the last great villages of the Sioux and Cheyenne, the largest ever on the Plains. As well as the wealth of anthropological information inherent in such camps, they have a high historical value to the people of the United States, just as does the site of Fort Phil Kearny and the Battle of the Little Big Horn, and other reminders of the last of the great military campaigns in the westward expansion.

We know beyond any doubt that these camps are there, yet essentially none have ever been located. Why is this? The debris and alteration of the local environment by a camp of 500 or 1000 or 5000 people is far more substantial than most people can conceive. The writer can only conclude that they are there, in the floodplain sods and a little below. An exposure along a river bank may cut a few lodge areas, leading archaeologists to note in passing another "flake scatter". The sites are diffuse, but excavations stripping back a few hundred feet would quickly reveal the edge of literally hundreds of hearths, packed lodge floors, food processing areas, bone dumps, post molds, workshop areas, thousands of artifacts and other features.

One can go through any account of early exploration on the plains and glean hundreds of references to finding camp after deserted camp along the river bottoms, literally miles of broken poles, hearths, butchered bone, discarded tools, and chopped down trees (e.g. Wedel 1963:9, 10; Whitehouse 1804:38, 40, 60, 61, 85, 91, etc.). The camps are there, all right, and careful cultural resource management in the Powder River Basin will bring them to light.

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CHAPTER V
ARCHEOLOGICAL RESOURCES

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There are presently 277 known archeological sites within the project boundaries. They are all bonafide sites in that only those sites are included which definitely reflect some type of cultural activity. Locals where single isolated artifacts were found do not qualify as sites since they may or may not indicate prehistoric activity. For example, the authors have personally observed chert flakes caught in the mud on the leg of a range cow. The mud with the flake can be dropped a considerable distance from its place of origin. Another good example of how artifacts can be artificially relocated comes from a local rancher who tells of once finding several projectile points near a gate. He picked the points up out of curiosity and reports that they were later thrown at stubborn cows to keep the animals moving down the trail. Also, it is very common for amateurs or other collectors to pick up objects at one location and to discard them later elsewhere. A common feature at many sites are little piles of flakes which someone has picked up over a large area, and then decided to leave them behind as they continued their searching for more exotic items. What this means is that one must be very careful in his interpretations of cultural activities in superficial context and must always be alert for signs of disturbance due to collectors and livestock. Carelessness or oversight on the part of investigators can easily result in misinterpretations of the archeological record.

The significance of many of the known sites remains to be determined. Several sites which will be affected by industrial development will be tested in the near future. The 277 known sites can easily be divided into ten categories. Sites within each category vary in their significance and potential to contribute to the archeological record. The 10 categories are discussed below:

1. Light concentrations of debitage.
   There are 211 sites in this category. These sites are usually open areas and are either on bedrock or are highly eroded. Sometimes subsurface materials are present, but this usually cannot be determined by a surface examination. For example, several such sites on the Atlantic Richfield Coal Creek lease produced a variety of artifacts (Plates 14, 15, 16) and will need to be tested to determine if they have any scientific potential. Three similar sites were tested on the Atlantic Richfield Black Thunder lease but only one produced data of any consequence (Plates 17, 18). These kinds of sites are sometimes

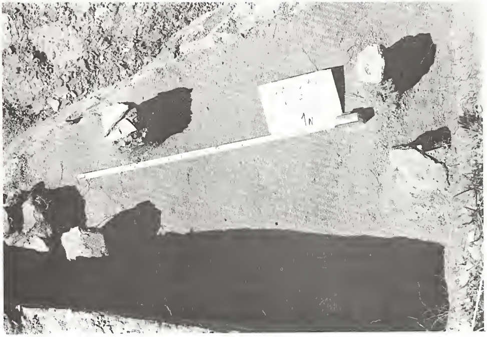

PLATE 14: Artifact distribution at a site characterized by a light concentration of debitage.

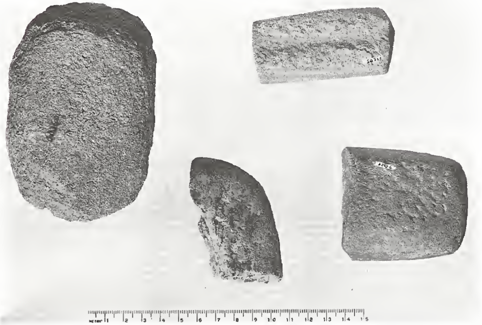

PLATE 15: Grinding stones from a site characterized by a light concentration of debitage.

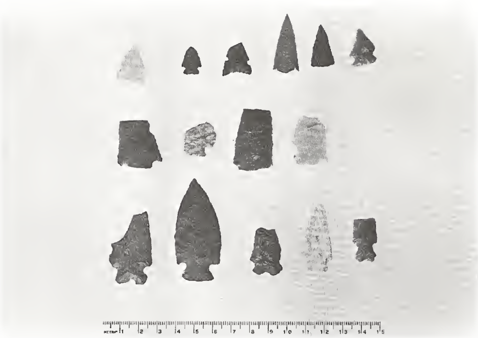

PLATE 16: Projectile points from the open camps at the Atlantic Richfield Coal Creek Lease.

PLATE 17: Pottery in situ from a site characterized by light scatter of debitage on the Atlantic Richfield Black Thunder Lease.

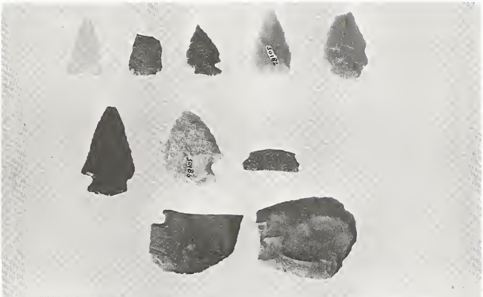

PLATE 18: Projectile points from several camp sites on the Atlantic Richfield Black Thunder Lease.

extremely difficult to evaluate. The Hanson Site (see Chapter 3) would have fallen into this category at the time of its discovery. Subsequent testing revealed that it was of Paleo-Indian vintage and was indeed one of the most important sites in North America. The same situation was true at the Colby Site. In fact, experienced geologists predicted that no subsurface deposits would be found at Colby. Tests by determined archeologists revealed that the site contained the remains of at least 7 mammoths. The point is that the only way to evaluate many sites of this nature is by subsurface testing. Usually within only a few hours of digging, a reliable evaluation can be made.

2. Stratified Sites

Presently only 3 stratified sites are known from this area. One of these, 48CA85 on the Carter Mining Rawhide lease, may prove to be a very significant site. Here tipi rings were found on the surface and several buried levels containing cultural material were visible in the cut-banks below. If any of the levels are productive and datable the site is very important. Subsurface testing will be needed for a better evaluation. A similar site was tested on the Atlantic Richfield

Black Thunder lease but proved to be of no value (Plate 19).

3. Bone Beds

Bison bones are very common and apparently the area supported a large bison population at least during certain periods in the past (see Chapter 2). Bones can be found in the banks of almost every deep arroyo, but seem to be concentrated at a depth from about 10 to 15 feet. These bones do not indicate cultural activity and apparently represent natural deaths. The bone bearing deposits may reflect some change in the climate which apparently was favorable for a drastic increase in the size of bison herds. Unfortunately they have never been dated. They can be dated using radiocarbon, geological, and dendrochronological methods.

Six bison bone beds are definitely of cultural origin. Two sites have been excavated, the Glenrock and Ruby Kills (see Chapter 3). One is presently under excavation on the Sun Oil lease (Plates 20, 21), and another on the boundary between the Carter Mining and Kerr-McGee leases will be excavated during the 1977 field season (Plates 22, 23, 24). Bison kill sites contain a

PLATE 19: Stratified camp site on the Atlantic Richfield Black Thunder Lease.

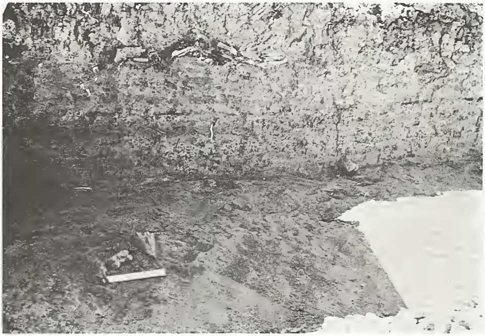

PLATE 20: Bone bed at the Sun Oil Cordero Mine.

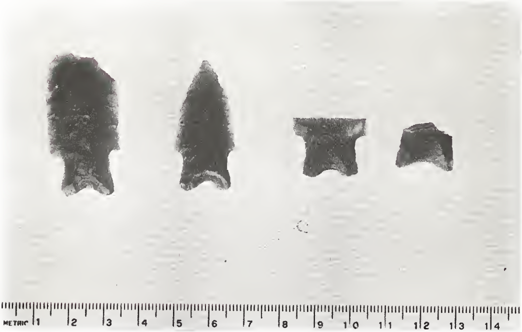

PLATE 21: Projectile points from the bone bed at the Sun Oil Cordero Mine.

PLATE 22: Overview of the Eden Complex bone bed on the Carter Oil-Kerr McGee coal leases.

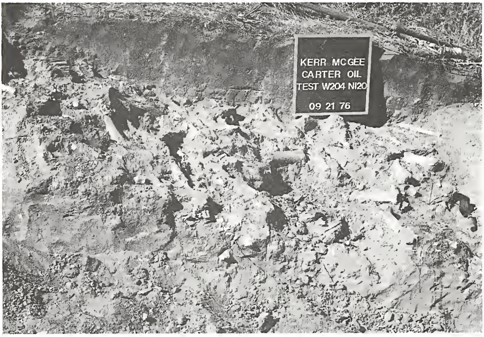

PLATE 23: Bone bed at the Eden Complex Buffalo kill on the Carter Oil-Kerr McGee coal leases.

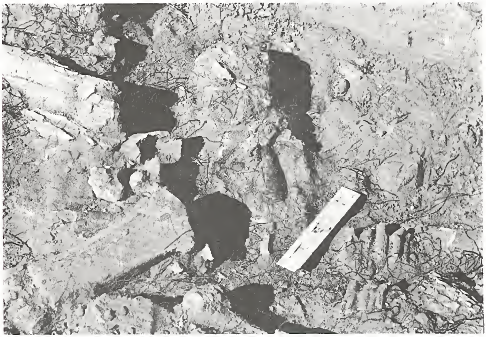

PLATE 24: Eden Complex projectile point _in situ_ at the bone bed on the Carter Oil-Kerr McGee coal lease.

tremendous amount of data concerning past climates, trends in bison evolution, cultural hunting and burchering practices, seasonality of cultural activities, etc.

4. Ceramic Sites

Five sites in the area are known to contain ceramics. Ceramics are good time-markers and are very useful in tracing movements of and relationships between prehistoric groups. Unfortunately no site in the area has yet yielded pottery in a definitive context. Two sites on the Black Thunder lease produced undateable sherds (Plate 25, upper and middle rows). Another site along the new Burlington Northern Railroad near the Belle Fourche River also yielded fragmentary and undateable sherds mixed with a large number of artifacts (Plate 25, lower row, 26, 27, 28). The Belle Fourche site was highly eroded and cultural materials from several time periods were mixed together on the surface. These materials would become much more meaningful if they could be compared with materials from dated sites.

5. Burials

Only one burial has been recorded from the study area. Rumors of several others have been circula-

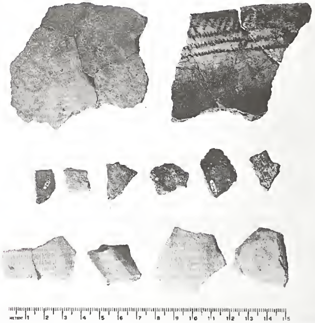

PLATE 25: Pottery styles from the Powder River Basin; upper and middle rows: Black Thunder Mine; lower row: Belle Fourche Ceramic Site.

PLATE 26: Projectile points from the Belle Fourche Ceramic Site.

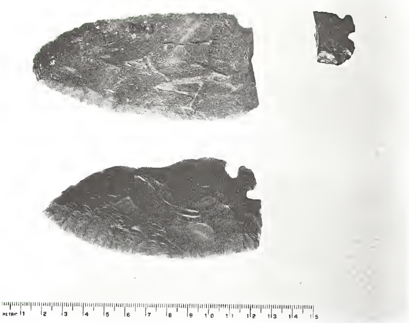

PLATE 27: Tanged knives from the Belle Fourche Ceramic Site.

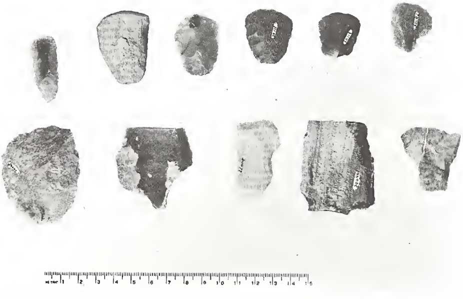

PLATE 28: Scrapers from the Belle Fourche Ceramic Site.

ting but only the one has been confirmed. This burial was found near Douglas and was presented to the University of Wyoming Anthropology Department, in a card board box by an amateur excavator. The burial appears to have been a 40 year old male American Indian. Nothing is known about the context or cultural affiliations of the remains.

Many more such burials probably exist in the area and may be exposed at any time. This type of site yields information of a nature that cannot be gained from other sites. Human skeletal remains can reveal data concerning physical morphological features of past populations.

6. Rockshelters

One rockshelter site has been recorded from the study area. Rockshelters and caves normally yield information of an entirely different nature than open camps in that the deposits are often dry, and sometimes preserve materials that perish in open sites.

The rockshelter recorded from Campbell County differed in that the deposits contained within were wet, not dry, and only slight evidence of archeological materials could be found. Several areas of the study area contain rock outcrops suitable for rockshelter formation and any of these could yield cultural material on the order of other shelters recorded by Frison (1962, 1965, 1968).

7. Stone Circles

Twenty-eight stone circle sites have been recorded from the survey area but only four of these have been investigated in some detail. These sites are described below.

Site 48CA22 (Figure 13) is located in the middle of the section line bisecting sections 29 and 30, T48N., R70W., Campbell County, Wyoming. This site is on a deflated ridge top. Vegetation in the area is sage, grasses and cactus. Surface features consist of 21 stone circles and three stone clusters with stones from local rock outcroppings being used. The stones were all about the same size, approximately ten inches in diameter. Disturbance to some circles was noted. Stone circles 1, 7, 11, and 20 were tested but no buried cultural materials were recovered. None of the stone circle sites described in this report contain evidence for living floors, firehearths, superstructures or other features. Cultural affiliation of these sites is not known as this time as nothing

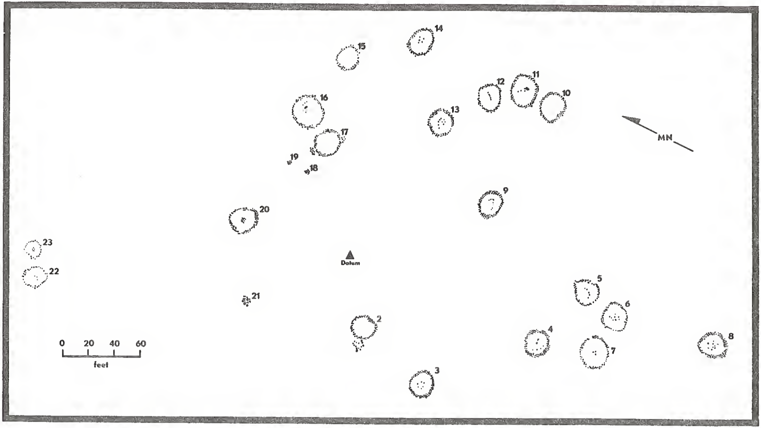

FIGURE 13: Stone circle distribution at 48CA22

diagnostic was found and no carbon was available for dating purposes.

Feature 1	Stone Circle 12' North-South, 10' East-West 79 Stones small circle on east side
Feature 2	Stone Circle 4' North-South, 6' East-West 14 stones
Feature 3	Stone Circle 12' North-South, 12' East-West 95 stones 6 stones in center of circle
Feature 4	Stone Circle 12' North-South, 14' East-West 114 stones 6 stones in circle
Feature 5	Stone Circle 14' North-South, 12' East-West 60 stones 5 stones in circle
Feature 6	Stone Circle 14' North-South, 12' East-West 58 stones 8 stones in circle
Feature 7	Stone Circle 16' North-South, 16' East-West 64 stones 3 stones in circle
Feature 8	Stone Circle 14' North-South, 12' East-West 127 stones 9 stones in circle
Feature 9	Stone Circle 10' North-South, 12' East-West 94 stones 8 stones in circle
Feature 10	Stone Circle 12' North-South, 14' East-West 98 stones

Feature 11	Stone Circle 14' North-South, 16' East-West 97 stones 5 stones in circle
Feature 12	Stone Circle 14' North-South, 14' East-West 61 stones 5 stones in circle
Feature 13	Stone Circle 12' North-South, 12' East-West 80 stones 9 stones in circle
Feature 14	Stone Circle 10' North-South, 14' East-West 93 stones 5 stones in circle
Feature 15	Stone Circle 10' North-South, 12' East-West 47 stones
Feature 16	Stone Circle 16' North-South, 16' East-West 76 stones 7 stones in circle
Feature 17	Stone Circle 12' North-South, 14' East-West 81 stones 2 associated clusters outside of main circle
Feature 18	Stone Cluster 2' North-South, 4' East-West 9 stones
Feature 19	Stone Cluster 2' North-South, 4' East-West 9 stones
Feature 20	Stone Circle 12' North-South, 14' East-West 81 stones 10 stones in circle
Feature 21	Stone Pile (badly potted) 14 stones

Feature 22	Stone Circle 10' North-South, 12' East-West 33 stones 3 stones in circle
Feature 23	Stone Circle 8' North-South, 8' East-West 21 stones 5 stones in circle

Site 49CA328 (Figure 14) is located in the NE¼ of Section 23, T42N., R70W., Campbell County. The site is on a rim overlooking a small basin to the east. Vegetation is sparse; grasses and small sagebrush dominate. This site consists of three stone circles. Stones composing the circles are local sandstone which is available a few feet from the site. No other cultural material or features were found within and around the site. One piece of unmodified coal-glass was found near the circles.

Feature 1	Stone Circle 19'5" North-South, 17'2" East-West 46 stones 4-12" diameter
Figure 2	Stone Circle 16'6" North-South, 14'5" East-West 42 stones 2-12" diameter
Figure 3	Stone Circle 14'10" North-South, 13'1" East-West 21 stones 4-12" diameter

Site 48CA329 (Figure 15) is located in the SW¼ of Section 28, T42N., R69W., Campbell County,

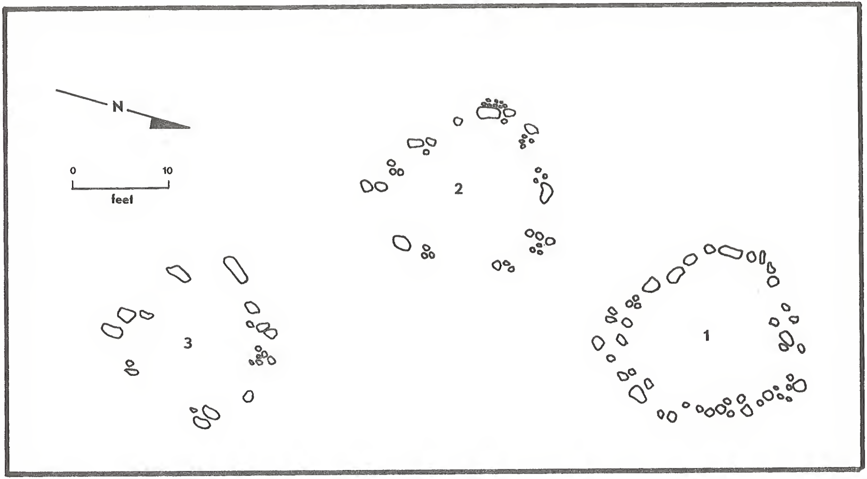

FIGURE 14: Stone circle distribution at 48CA328

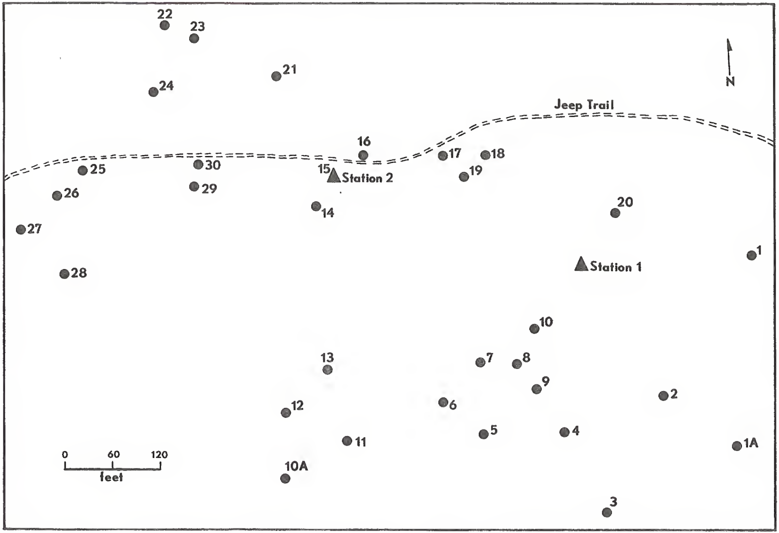

FIGURE 15: Stone circle distribution at 48CA329

Wyoming. An east-west road passes through the site, resulting in some damage. There are 32 stone circles, some of which were tested. However, due to a lack of subsurface deposits, testing was limited. No subsurface cultural material was revealed in any of the circles.

Feature 1	Stone Circle 13' North-South, 10' East-West 47 stones 8-10" average diameter Cluster on southwest side
Feature 1A	Stone Circle North 40° West, 177' from Circle 2 13' North-South, 14' East-West 31 stones 12-15" diameter
Feature 2	Stone Circle 15' North-South, 14' East-West 48 stones 8-15" diameter
Feature 3	Stone Circle 16' North-South, 17' East-West 43 stones 10-18" diameter
Feature 4	Stone Circle 17' North-South, 17' East-West 58 stones 8-24" diameter
Feature 5	Stone Circle 16' North-South, 12½' East-West 35 stones 8-12" diameter Cluster of 8 on southwest corner
Feature 6	Stone Circle 13' North-South, 16' East-West 70 stones 8-12" diameter

Feature 7	Stone Circle 17' North-South, 16' East-West 64 stones 8-12" diameter
Feature 8	Stone Circle 16' North-South, 16' East-West 12-18" diameter
Feature 9	Stone Circle 12' North-South, 12' East-West 41 stones 10-15" diameter
Feature 10	Stone Circle 11' North-South, 13' East-West 42 stones 8-12" diameter
Feature 10A	Stone Circle North 30 East, 91' from Circle 11 12' North-South, 10' East-West 42 stones 12-18" diameter 18 stones clustered on southwest quarter
Feature 11	Stone Circle 16' North-South, 16' East-West 92 stones 8-18" diameter
Feature 12	Stone Circle 16' North-South, 19' East-West 54 stones 12-18" diameter
Feature 13	Stone Circle 18' North-South, 16' East-West 77 stones 6-8" diameter
Feature 14	Stone Circles 16' North-South, 20' East-West 67 stones 8-15" diameter

Feature 15 is also Station 2	Stone Circle 16' North-South, 14' East-West 68 stones 8-10" diameter Very few in south-west quarter Most in north-east quarter
Feature 16	Stone Circle 10' North-South, 11' East-West 30 stones 8-10" diameter East 1/3 wiped out by road
Feature 17	Stone Circle 12' North-South, 14' East-West 53 stones 6-8" diameter most are around 6", 2 are 12"
Feature 18	Stone Circle 16' North-South, 17' East-West 104 stones 6-8" diameter
Feature 19	Stone Circle 17' North-South, 15' East-West 94 stones 6-10" diameter
Feature 20	Stone Circle 18' North-South, 19' East-West 124 stones 6-8" diameter
Feature 21	Stone Circle 18' North-South, 17' East-West 95 stones 8-15" diameter
Feature 22	Stone Circle 13' North-South, 16' East-West 45 stones 10-15" diameter
Feature 23	Stone Circle 17' North-South, 15' East-West 52 stones Most on north side 10-18" diameter

Feature 24	Stone Circle 15' North-South, 15' East-West 77 stones 12-15" diameter
Feature 25	Stone Circle 13' North-South, 12' East-West 52 stones 8-12" diameter Clustered 20 on southwest side
Feature 26	Stone Circle 10' North-South, 11' East-West 18 stones 15-20" diameter
Feature 27	Stone Circle 15' North-South, 15' East-West 35 stones 15-20" diameter
Feature 28	Stone Circle 17' North-South, 16' East-West 29 stones 10-15" diameter
Feature 29	Stone Circle 12' North-South, 13' East-West 55 stones Most are 8-10" diameter 3 are 10-14" diameter
Feature 30	Stone Circle 12' North-South, 14' East-West 62 stones 8-12" diameter road wiped out north side (1-2' only)

Site 48CA330 (Figure 16) is located in the center of Section 28, T42N., R69W., Campbell County, Wyoming. The site is positioned at the confluence of two intermittent streams at the base of a scoria bluff. One stream is approximately 70 feet north of the site and runs

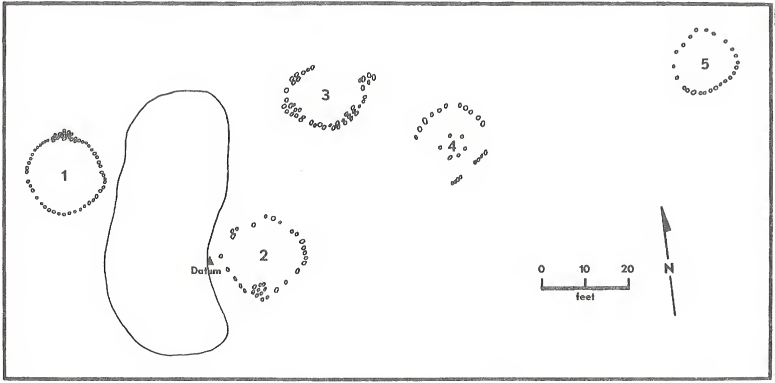

FIGURE 16: Stone circle distribution at 48CA330

westnorthwest. The other stream is north of the site approximately 300 feet and runs east-west. There is evidence for aboriginal quarrying along the southernmost stream. Vegetation consists of buffalo berry bushes, small sage, short grasses and cactus. Most berry bushes grow along the southern stream bank. Milkweed grows along the northern most stream. This site contains five stone circles. The circles are composed of clinkers, scoria-like material, probably collected from a rock outcropping located within the site (large circle showing on Figure 16). A small flake sample and one stone drill were collected. South of the site, one tri-notch point was also found. Six areas within the circles were tested but nothing significant was recovered. No diagnostic artifacts were found in the site area. The tri-notch point found to the south may not be associated with the site.

Feature 1	Stone Circle 15' North-South, 17' East-West 24 stones 10-12" diameter
Feature 2	Stone Circle 18' North-South, 17' East-West 23 stones 10-18" diameter 6 stones in circle

Feature 3	Stone Circle 14' North-South, 18' East-West 40 stones 6-18" diameter
Feature 4	Stone Circle 21' North-South, 20' East-West 30 stones 12-18" diameter 6 stones in circle
Feature 5	Stone Circle 18' North-South, 18' East-West 70 stones 6-15" diameter

Stone circles are some of the most frustrating features to the Northwestern Plains archeologist. More commonly called tipi rings, these archeological sites are numerous in this area; their purpose and significance perplexing.

Stone circles are found throghout the Plains and transitional portions of the Montana-Wyoming area, in the western part of Nebraska and the Dakotas, southward through Colorado and into northern New Mexico, and northward an undertermined distance into Canada. Hoffman believes their center of radiation was in the high plains of central Montana (1953:1). Typical locations for stone circle sites are on high ridge tops, along edges of stream and drainage terrace fingers. Sometimes they are found in valley bottoms or on rises above the confluences of drainage systems.

Tipi rings should not be confused with remains of aboriginal lodges of piled sandstone slabs which once formed dry masonry walls and containing cultural debris (Zeimens, 1975) nor are they to be confused with remains of log lodges, multi-sided structures with walls of an irregular crib work of logs and wood fragments on a stone foundation found at Thirty Mile Mesa, Montana (Mulloy 1965:3). Instead, tipi rings consist of intermittently placed stones usually in a circular formation. Stone circles vary in size and shape and contain a paucity of cultural material. The number of circles in one locality may range from an isolated circle to 100 or more (Frison, in press).

"Tipi rings clusters are generally considered to be the archeological remains of camps and villages of people who dwelt in conical skin covered lodges" (Malouf 1961:381-389). Ethnographic accounts have referred to the stones as weights to hold the skin coverings down against the wind. However, ethnographic data does not always substantiate the purpose of the tipi ring. Some amateurs as well as professionals speculate a religious or ceremonial function for the stone rings.

The location of stone circle sites is somewhat puzzling. One might expect to find sites close to water, food, and in sheltered areas. In many cases this is so. For example, site 48CA330, just described, is located at the confluence of two intermittent streams. Other sites in the project area, such as 48CA316, 48CO102, 48CA85 and 48CO17 are located near springs, creeks or major river drainages. However, this is not always the case.

More often, tipi ring sites are found along high ridges with a water source some distance away. Perhaps the occupants had ways of packing water with them. Crawford suggests that rings are as often as not away from water and wood (1931). Malouf attributes dry and waterless camps, through his ethnographic studies, to the prehistoric travelers who moved between water courses rather than just up and down streams. He suggests, that "these clusters of stone circles were constructed mostly during favorable seasons, but were placed on higher points in order to avoid long lasting wintertime snow drifts. Perhaps the hunters chose to remain away from the springs in order to avoid scaring game" (1961: 381-389). Kehoe suggests that a blizzard may cause groups, especially those without horses, to make camp immediately (1958:863). Mulloy notes that lack of a spring or other water source in the vicinity further suggests that much of this occupation was during the wet seasons: winter and spring (1965:17).

The size of stone circles is known to vary from two feet to as much as 80 feet in diameter. Malouf finds most circles average from 12 feet to 25 feet in diameter (1961). Kehoe (1958) attributes the larger circles to later aboriginal parties who had acquired the horse. A dog could not have carried the weight of larger tipis. Malouf (1961:385) suggests that rings over 30 feet in diameter were probably not domestic in origin but were ceremonial structures. For instance, the Great Medicine Wheel in the Big Horn Mountains east of Lovell, Wyoming is 80 feet across. Also, extremely small stone circles, two to six feet in diameter, were probably used in a nondomestic manner. Ethnographic studies in western Montana have shown that the Flathead and Upper Pend de Orielle, sought medicine in small stone circles located on certain hilltops in their domain (Hoffman 1953:4).

A basic stone circle form is a circular arrangement of stone laid on the surface of the ground. Bands of stone varied in width from a single row of stones to bands over four feet wide (Mulloy and Steege, 1967:178). These stones are usually local material. They may be limestone slabs or clinkers from local rock outcroppings or cobbles from a nearby stream bed. Kehoe's studies on the Blackfoot Reservation concluded that the quantity and size of stones are always consistent with the amount that would be necessary to anchor a tipi cover. For example, where rocks are small, a greater number would be gathered and vice versa. He also associated larger rings with fewer stones. This may indicate that later historic tipi covers were also held down by wooden pegs (Kehoe, 1958:864).

Stone circle forms may vary from feature to feature. The tipi ring form is not always circular. Many times it is somewhat elliptical. According to Wedel, many of the stone circles:

> "...depart more or less widely from a circular form: they may be eccentric, elliptical, D-shaped, or vaguely square or quadrilateral. Sometimes the 'rings' intersect each other in bewildering fashion, or they may adjoin one or more neighboring rings which they share a common dividing line of stones" (1961:264-265).

There are several types of stone circles. Some circles have a single band of rock, others have double and sometimes triple bands. Kehoe discovered that some Blackfoot tipis had inner liners that were held down by stones. He found that stone rings left by the liners closely approximated the dimensions of the original structure (Kehoe 1958:87). If, in addition to the tipi liner, stones were also used to hold down the outer hide covers, two rows of stone rings would remain after the tipi was disassembled. Perhaps this is an explanation for double and sometimes triple coursed rings found in the previously described sites: 48CA22, 48CA328, and 48CA330.

Site 48CA22 consists of complete stone circles. Most are circular in shape, however, a few appear elliptical. Ring 5 is tear-shaped. Fourteen circles are double or triple coursed. Rings 2 and 3 are simple to single coursed. According to Hoffman (1953), simple coursed rings are those with each stone touching or almost touching the ones next to it.

At site 48CA330 all rings are complete and, for the most part, circular. Ring 5 is tear-shaped

Rings 1 and 5 are simple to single coursed. Rings 2 and 4 are simple coursed. Ring 3 is double or triple coursed. One must realize, however, that with time the original form of rings may become disturbed by livestock or natural agencies. Some probably have been disturbed, but others may be intentional semi-circles used as windbreaks, for shade against the sun or perhaps for food drying racks. Malouf says that partial rings indicate the cluster was occupied not once but on several occasions when the stones were removed from an older ring and placed around a new one (1961:382).

Tipi ring sites are noted for the lack of cultural materials. Even excavations usually produce next to nothing. Perhaps most rings represent only short-term occupations of a day or so (Frison, in press). Piles of stone or small stone circles sometimes found withint the rings suggest firehearths. However, most cooking was done outside the tipi. Since most activity took place outside the tipi, rings lack living floors (Kehoe, 1958:871). Kehoe also believes that roving Indians did not leave masses of garbage behind. Most of it was of organic materials left on the surface of the ground where it decomposed (1958).

Age determination and cultural affiliation of these sites is difficult to ascertain due to scarcity and inconsistency of diagnostic cultural materials. Lack of firehearths make it difficult to obtain a carbon sample for radiocarbon dating. However, artifacts that have been found suggest Middle and Late Plains Archaic and the Late Prehistoric as periods of a widespread use of stone circles on the Northwest Plains (Frison, in press).

Several authors have offered interpretations of the function of stone circles. Kehoe argues in favor of stone circles being the reamins of historic tipis. He states, "...nevertheless sufficient evidence does exist, it is here maintained, to demonstrate that these stone rings are actually what their popular name implies; rings of stones employed by Indians to anchor the peripheries of their skin lodges" (1958:861). However, the question is still inconclusive as his data rests mainly on Blackfoot Indian informants in Montana. Kehoe supports his statement by evidence gathered through historical, ethnological, and limited archeological means. Kehoe (1960) said that both historical and ethnological materials relate to the question of stone circles and their use and prove more fruitful than excavation in clarifying the function of the rings. Ethnographic evidence was collected through friendly talks and interviews with elderly Indians. His Blackfoot informants each attested that stones were used by their ancestors as weights to hold down lodge covers, resulting in tipi rings.

Malouf proposes a domestic origin for most stone circles. "Their size, form and location together with the artifact association are too strong to deny" (1961:288). However, he believes not all stone circles are tipi rings. He lists several types of stone circles.

1) A single course of stone in a simple circle
2) More complex circles with several courses of stone
3) Circular walls made of piled-up stones
4) Corrals or forts of horizontal logs or stones
5) Ceremonial circles--stone circles of unusual size or with lines of rock inside the circle (Malouf 1961:381).

Even though Malouf does agree that some stone circles are domestic, he does not agree with Kehoe in that ethnographic data proves more fruitful than archeological data. For instance, Malouf believes "...ethnographic data does not always substantiate the use of rock to hold down lodge covers". In fact, he had heard Indians talk of putting stones around the outside of their tipis to make them invisible, magically, to enemies who might be lurking in the vicinity (1961:387).

Mulloy, through his archeological investigations in Wyoming and Montana, believes many stone circles are:

> "...part of a complex which had a ceremonial rather than a practical function. They may have been erected as shrines, dance areas, or for some more obscure purpose. Possibly, they are related to the Great Medicine Wheel high in the Big Horn Mountains (1958:212-213).

One reason why Mulloy favors a ceremonial origin for a large quantity of stone circles is that the size range of stone circles is too great to suggest a lodge outline. Also there are many more stones forming the circle than would be necessary to hold a tipi cover (1958:212). He also notes the lack of debitage at these sites. Mulloy believes people often confuse the tipi ring with log lodges. Although the physical remains of both include circles of stone, the two are unrelated structures. The log lodges are wooden superstructures which, when decomposed, leave a stone slab circle. These are habitation sites with hardpacked floors and central firehearths (1958:213).

Mulloy has conducted surveys along the Platte and Big Horn Rivers, in the Laramie Basin and at Thirty Mile Mesa, Montana. He suggests stone circles may be either of domestic or nondomestic origin, but is skeptical of a domestic origin for these features. In order for a structure to be labeled "domestic", it must have the following qualities: packed living floors, evidence of fire, interior features, entrance gaps and living debris. Also important are features such as locations of stone circle sites and other evidence of domestic activity in the proximity of the stone circles (Mulloy 1958:213).

Malouf attacks Mulloy's arguement that certain stone circles are not habitational because of the lack of artifacts:

> "If Mulloy is skeptical because of a lack of artifacts, then he should also regard the magnitude of the ceremonialism far beyond the scope of anything known among the historic tribes in the area (Malouf 1961:383)".

Malouf confronts Mulloy on still another domestic structure qualification. Mulloy notes that domestic sites would not be located in an unfavorable camping area. Malouf differs: "the great number of mapped sites show that rings are in favorable camping sites" (Malouf 1961:383).

In this arguement of domestic versus non-domestic structures, Mulloy and Kehoe are at opposite ends. Kehoe criticizes Mulloy for refusing to commit himself as to the original purpose of the circles, but still believes some of the circles may be related to the so-called "medicine wheels" (Kehoe 1960). In turn, Mulloy states:

> "It would be an error to consider the problems of stone circles as solved by assuming that they result from this practice only or even that the majority of them can be accounted for this way" (Mulloy 1965:49).

Stone circles have frustrated investigators for years and probably will continue to do so in the future. But a lack of information on these features has not halted attempts to learn about their origin and use. Most investigators still consider stone circles as habitational remains rather than as ceremonial structures. Presently, there is no consensus of opinion on their origin or function. The most probable origin of stone circles may be the use of stones to weigh tipi covers down against the wind.

Some clues have been gleaned from the ethnographic record, but detailed accounts are rare.

The archeological problems concerning stone circles will remain until a better methodology can be developed for investigating these features. Hopefully, an adequate sample of the stone features will be preserved for future research.

8, Quarries

Thirteen quarries have been recorded from the study area. Most of these appear to be of the same general nature, that is, a lag gravel cap covering a ridge top will show extensive use of the cobbles for lithic sources. The raw materials would be taken from the ground surface and no actual pits would be dug. The activity at this type of quarry consisted entirely of choosing cobbles that appeared to be suitable for flaking, hitting the rock with a hammerstone, producing flakes to be shaped later into tools. A wide variety of materials would be utilized in quarries of this nature, depending on the cobble materials.

Another type of quarry that has not been recorded from the study area but that should be expected is quarries of metamorphosed shale, the natural glass formed from the overburden over burned-out coal beds. Several quarries of this material have been recorded in Montana just north of the area (Fredlund 1976:207-212) and also in Sheridan County, Wyoming (Frison 1975:61-64), just to the west. These quarries differ from most of the quarries in the study area in that extensive digging took place to recover the lithic material.

9. Fire Pit Sites

One of the more common features of open camps in the area is firehearths. The project area contains literally hundreds of hearths in various stages of preservation. Very little is known about these features. Some were dug in compacted soils which would have been no easy task using primitive tools. More often, they were constructed in sandy areas where digging would have been easier. Most appear to have been refilled after use and then reopened later to be reused several more times.

Four open camps have been dated by firehearths from the study area. Many other hearths have been excavated but were either to highly eroded to describe or did not contain enough carbon to permit dating. One dated fire hearth (Plate 29, Figure 17a) was excavated at 48CA7. Two other hearths were also excavated but not dated. The dated hearth is an ovoid, very shallow

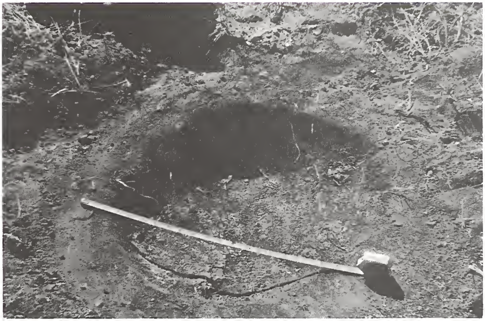

PLATE 29: Fire hearths at 48CA7.

lens-shaped hearth. About two pounds of rock, mostly local scoria, were laying on the ground surface. An unknown amount of the hearth had probably been eroded away. The remaining portion measured 58.5 x 48 cm. and was 10 cm. deep. The three hearths were dug into an outcrop of Eocene claystone. Local vegetation consisted of big sage, salt sage, prickly pear, and three or four varieties of grasses. The radio-carbon date for the hearth is A.D. 630 (1320±100 years, RL541).

Two hearths were excavated at 48CA56, approximately two miles south of 48CA7. Again, only one of the hearths (Plate 30, Figure 17b) contained sufficient charcoal for dating. The hearth was dated at A.D.360 (1590±110 years, RL599). This hearth was exposed along the bottom of a small tributary to Little Thunder Creek, about one meter below the present ground surface. This hearth was a slightly oval, basin-sahped pit, 48 x 43 cm. at the orifice and 15 cm. deep. It was lined with scoria rocks. The vegetation was similar to 48CA7, except junipers were present along the stream banks.

One fire hearth was datable at the ceramic site along the Belle Fourche River mentioned above.

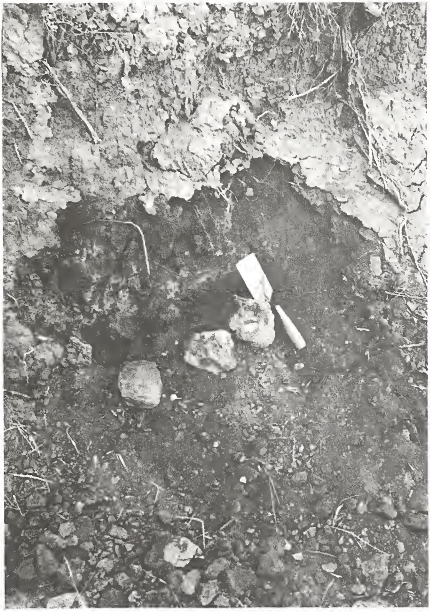

PLATE 30: Fire hearth at 48CA56.

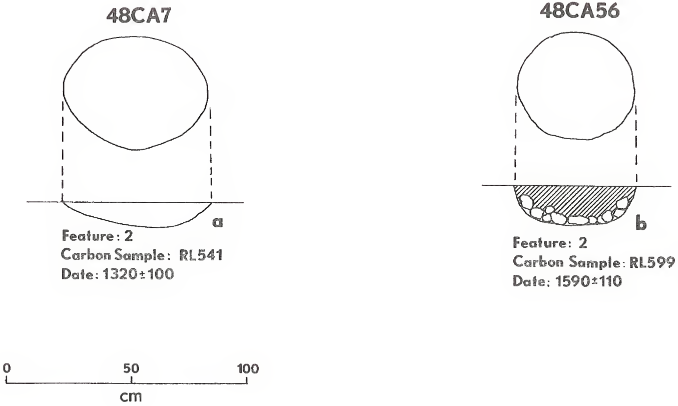

FIGURE 17: Fire hearth styles at 48CA7 and 48CA56

This hearth (Plate 31, Figure 18a) was exposed during topsoil removal for the Burlington Northern Railroad and it is felt that the entire hearth was present. The carbon date on this hearth has not been returned from the lab. The hearth was a deep, semi-bell shaped pit, with an orifice of 60 x 64 cm. The depth was 38 cm. A rock layer was present at 15 to 25 cm. below the surface. A red oxidation layer three cm. thick was present at the surface and tapered off at 28 cm. The portion below the rock layer was darker and contained more charcoal than that above.

A single hearth was exposed near the top of a 13 meter deep arroyo cut at 48CA384. This hearth appeared to be associated with a buried cultural level extending about 100 meters along the arroyo cut. The carbon date here is also pending. This is a deep, basin shaped pit with slightly sloping sides (Figure 18b). The orifice measured 48 x 48 cm. and depth was 38 cm. A 1.5 cm. thick oxidized layer extended down 28 cm. from the top of the pit. About 100 pounds of rock filled the pit, one piece of which was a broken metate fragment. Cottonwoods, big sagebrush, junipers, prickly pear and 3-4 grass varieties were present.

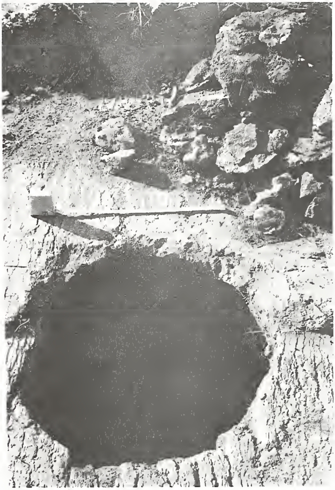

PLATE 31: Fire hearth at 48CA69, Belle Fourche Ceramic Site.

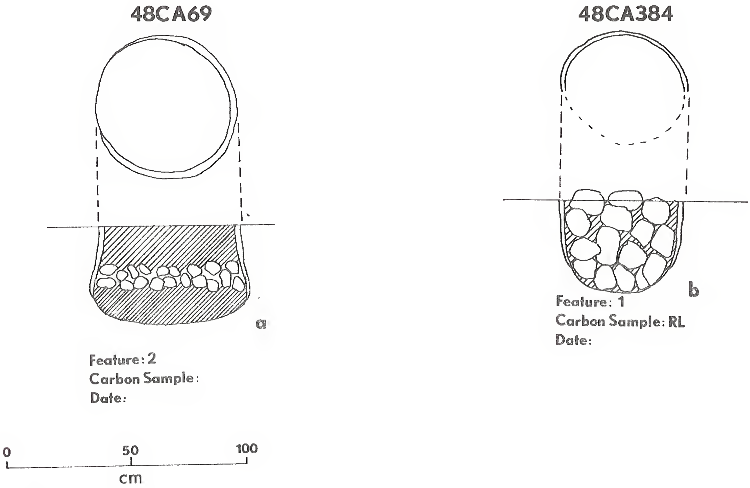

FIGURE 18: Fire hearth styles at 48CA69 and 48CA384

Dates on similar hearths in other parts of the state have ranged from over 5,000 years to only a few hundred years (Frison, in press; Zeimens and Walker 1977). There has not been nearly enough work at these kinds of sites to determine the temporal span of these, or to do statistical studies of the various periods of occupation.

It has been hypothesized that the pits represent vegetable processing activities (Mulloy 1954) but very little data has been collected to support this theory.

The ethnographic literature sheds but little light on the prehistoric uses of firepits. Rock lined pits are reported to have been used as "waterless cookers" for baking or roasting bulky edible roots, such as those of _Balsamorhiza sagitata_ (arrowroot), or large fruits such as _Yucca glauca_ (Harrington 1972). There are very few detailed accounts of pit construction and uses, but one observation of the White Mountain Apache of Arizona may be of some use (Reagan 1929: 146):

> "...the women go in a company to the hills where it grows,...Here they camp and proceed to the hills to collect the tubers. There are usually six or eight women in the group and it takes them about two days to gather a ton of tubers and carry them to

> camp (the beet-like root being gathered just before the stem is run up by nature to go to seed). When enough are gathered a large pit is dug and filled with dry wood. On this a large quantity of stones are piled. The wood is then kindled over this pile and kept burning. The cooking process is let have its course for a whole day. The pit is then opened and the tubers taken out and the mound left to puzzle the world after the Indians will have disappeared".

The practice had a wide distribution and was by no means limited to the basin and plains areas of the arid American West (Yanovsky 1936) or even to the North American continent. Nevertheless, archeological evidence from Wyoming clearly indicates that roasting pits were extensively used from very early dates in the Northwestern Plains, where they constitute a significant attribute of Plains Archaic features.

Attempts to retrieve plant remains from pits have been fruitless, other than charcoal particles which represent fuel, not edible. Various floatation methods have failed as well as experiments with opal phytoliths. No seeds have been recovered so far which suggests that no seed crops were being processed, or no seeds were dropped into the pits, or spilled seeds were destroyed by the fire. Occasionally a burned bone will be found, but as a rule, bones are not present in or around the pits. Heavily oxidized walls indicate that the pits were heated to extremely high temperatures, much higher than would have been needed to process either meat or vegetables. Extreme heat was probably needed to heat the rocks to a sufficiently high temperature so they would retain heat for a long time. The hot rocks, then, were probably used for cooking or for whatever purpose the pits were designed. The point remains that many more sites need to be tested extensively before a methodology can be developed for investigation of these very common and poorly understood features.

10. Rock Art

The final site type to be found in the study area is petroglyph and pictograph sites. Two petroglyph sites have been recorded, one in the southern portion of the area (48C044) and the other in the northern (48CA58). No pictograph sites are recorded. Both rock art sites are found on large vertical sandstone bluffs. The northern panel is quite extensive and probably merits National Register protection. The southern panel is not as extensive but is still important. Bot sites should be investigated by specialists in rock art analysis.

Due to the open terrain of the area, outcrops of sandstone or other suitable material are not common and therefore a large number of rock art sites should not be expected. Wherever suitable sites should not be expected. Wherever suitable panels exist, rock art should be watched for.

The above discussion is a brief summary of the various types of sites that have been recorded from the study area. Other types may be present but remain to be recorded. At the same time, many more known sites need to be tested or excavated before a proper evaluation of the known as well as the unknown sites can be made.

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CHAPTER VI
PREDICTIVE MODEL

GEORGE M. ZEIMENS

There are approximately 5,260,000 acres within the boundaries of this study. The acres that have been sampled total about 192,000 acres or a 3.6% sample of the surface area. Some of the acres surveyed did not receive complete coverage. The sample is non-random and non-stratified; i.e., it does not include portions of all the various environmental zones found in the area. Nor does it include a representative number of excavations from those sites which are known to contain subsurface cultural deposits. The sample is strongly skewed in favor of those low-lying lands which bear shallow, economically mineable mineral deposits. Within the areas sampled, only a few small areas of ecological diversity can be found. Those areas include only short portions of major riparian zones such as the Belle Fourche River, Thunder Creek, Coal Creek, Caballo Creek, and Raw Hide Creek. Site density has been found to be highest in those areas (Figures 19, 20, 21).

Based on data presented in the previous chapters, it is possible to make a number of assumptions concerning the prehistory of the area. These assumptions as they are presented here are necessarily broad in their scope since they are based on a limited quantity of data. They are

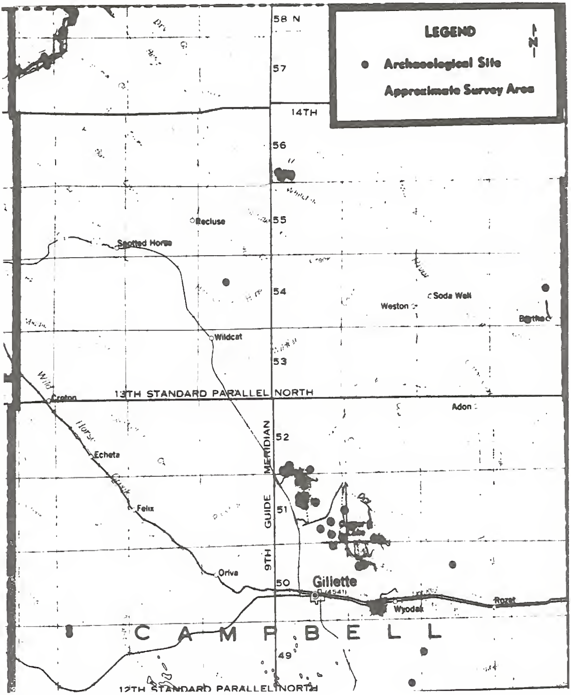

FIGURE 19: Site distribution and surveyed areas in Northern Campbell County, Wyoming.

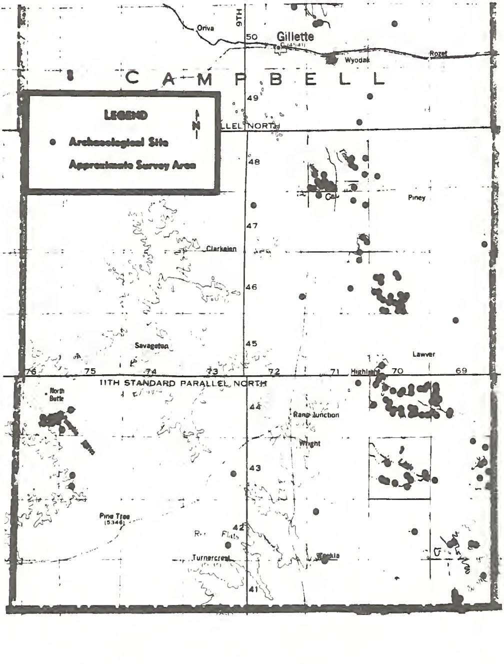

FIGURE 20: Site distribution and surveyed areas in Southern Campbell County, Wyoming.

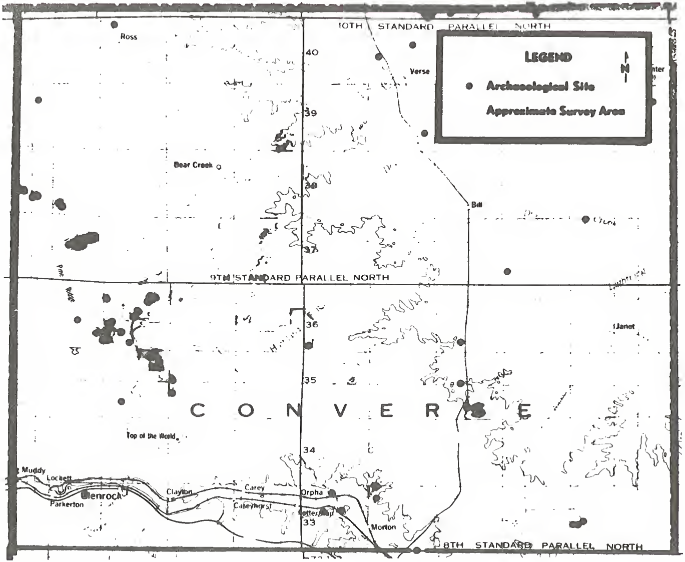

FIGURE 21: Site distribution and surveyed areas in Northern Converse County, Wyoming.

presented as a working set of testable hypotheses, or as a model which can be used for future studies in this area. As research progresses they should be revised to include more specific problems.

Hypotheses

H-1. Greatest site density will be at edge-areas, i.e., areas of greatest diversity of wild life and vegetation which will be found along the major drainages and in areas of greatest topographic relief.

H-2. Site density will be lowest in the large, flat, open, grasslands of little or no topographic relief.

H-3. Site visibility will be greater in areas which contain the least amount of soil deposits and low vegetation.

H-4. Site visibility will be lower in areas which contain the most amounts of soil deposits and vegetation.

H-5. Site densisty will be highest in areas where site visibility is the lowest. Because of this, many sites are not observable on the surface.

H-6. Historic sites will be from the late 19th century and early 20th century. No historical sites of major significance which are not already known will be found.

H-7. Late Prehistoric Period or Contact Period sites will be the largest and most numerous sites found in all areas. The major sites will be found in sheltered areas near water.

H-8. Contact Period sites will reflect a diversity of cultures and numerous influences from outside groups who were moving into the area.

H-9. Sites from the Archaic Periods will also be numerous. They will be found in all areas except on the most recent terraces on the flood plains.

H-10. Archaic Period sites will reflect mixed hunting and gathering subsistence activities.

H-11. Altithermal or Early Archaic sites will be extremely rare. If found at all, they will be in the extreme northeastern or southern portions of the area.

H-12. Paleo-Indian sites will be relatively rare. They may be present in all parts of the area but will be deeply buried. They will only be visible near the heads of deep modern arroyos and along the older eroded terraces. They will not be present along the lower terraces or flood plains along modern drainages.

H-13. Paleo-Indian sites will reflect a mixed hunting and gathering economy, but the most common site will be large communal kills.

H-14. All prehistoric sites reflect seasonal activities of cyclic hunters and gatherers exploiting local resources.

One objective of this study was to test the predictive model. However, because of lack of sufficient time, only one aspect of the model could be partially tested. The test was to check several pine-covered hilly regions; an ecological zone in which very little had been done in the past. The test was only to determine what degree of site density would be found in those areas.

Five regions were checked in various parts of the study area. The check included only a walk-through survey in which all sites were recorded but no cultural materials were collected. The survey resulted in extensive coverage of about 50% of each chosen area. The first included all of sections 10, 11, 12, 14, 15 and part of 16, T37N, R76W, Converse County. A total of 14 sites were found, 11 of which were stone circle sites and three of which were areas of scattered flakes and debitage. The area has the potential to contain many more sites.

The second region chosen consisted of 160 acres which produced only one site consisting of several stone tools and flakes scattered over about two acres. Two additional sites were found along the road to the area. One is a stratified campsite along Whach Off Creek. The other is a historic feature of unknown origin or significance. It is a circular rocklined pit about 6 feet across and 4 feet deep. The pit is filled with burned earth and has been practically covered by colluvium. Local ranchers say it has been there since the area was first settled and think that it may be a lime kiln used by early occupants of Fort Laramie.

The third region consisted of sections 24, 25, 26, T47N, R70W, and sections 20, 21, T47N, R69W, Campbell County. Here in the Rochelle Hills were found 13 sites, two of which were stone circle sites and 11 areas containing scattered flakes and tools on the surface. A more intensive survey here would surely produce more sites.

Region four included only the NE¼, NE¼, of section 2, T54N, R73W. The area produced 3 sites, one of which may be of National Register quality. Two sites were highly disturbed stone circles. The other consists of bison bones and charcoal eroding out of at least two levels along the banks of Squaw Creek. The site covers several acres, and the deposits may or may not represent secondary deposition. Subsurface testing will be needed to determine the significance of the site. Additional sites are likely to occur both along the creek and in the adjacent hills.

Region five included all of section 16, T54N, R73W, and contained the only site found during the model testing which definitely is eligible for inclusion in the National Register. The National Register site is a series of petroglyphs on a vertical sandstone panel. The designs are large and unique and are very well preserved. The other three sites found in this section are stone circles. One set of circles may contain buried cultural materials, but subsurface testing will be needed to make that determination.

Most of the model remains to be tested. Only about 7,400 acres of pine covered during this project, and only about 50% of these (3,600 acres) were covered intensively. The result was that the area produced 24 sites or one site for each 160 acres covered intensively.

CHAPTER VII
SUMMARY AND RECOMMENDATIONS

George M. Zeimens

Very little direct evidence has been collected with which to interpret the prehistory of the study area. Most of what can be said has been extrapolated from studies in the general region. The area potentially has been occupied for the past 11,200 years. The past environment and adaptive strategies of the prehistoric inhabitants are not yet clear. Apparently the area provided a variety of animal and vegetable resources that were exploited on a seasonal basis by small family or band level nomadic groups. Tribal levels of social organization were apparently only achieved very late, after acquisition of the horse and gun.

The bulk of archeological resources of the area remain to be developed. A necessary first step in the development of these resources is to inventory. So far a maximum of 3.66% of the area in question has been inventoried. The next logical step is to evaluate the resources. Evaluations are presently based on a mere handful of examinations. Dated sites and materials are conspicuously absent. If evaluations are to determine the potential of a specific resource to contribute significant information, then a number of sites will have to be examined in detail before proper evaluations can be made. The kinds of sites contained in the area (mainly small open camps) have been neglected in the past. Before evaluations can be valid, a methodology will need to be developed for exploiting these resources. A number of sites will need to be excavated in their entirety to develop the necessary methodological expertise.

The predictive model developed here has only limited value at this time. It mainly states that site density will be higher along the major drainages and in areas of topographic relief. Those areas contain the greatest variation and most easily exploitable food resources. Ironically, that pattern has changed little with the advent of contemporary society. Present habitation, farms, ranches, towns, have located on the same spots most favorable for prehistoric settlements and for the same reasons, i.e., food, water, and shelter.

The most obvious limitations of the model is the size of the sample upon which it is based. As stated several times, the area which has been inventoried is too small, and does not represent a stratified, non-random, unaligned sample. The sample also lacks excavations and dates from the sites. The model needs to be tested and revised many times over before it can become a useful tool for those involved in resource management.

Site visibility in the area is another real problem. Areas where site density is high also has the poorest visibility because of dense vegetation and deep soil deposits. Those areas which are to be developed for industrial use need to be scrutinized more closely. One method of doing this would be to dig numerous test trenches across the flood plains before they are disturbed. That method does not seem to be economically feasible since large areas are usually involved. A second and probably more acceptable method would be for acheologists to monitor the removal of topsoil from the area in preparation for mining. Under present rules the topsoil has to be stripped separately anyway. This would allow the archeologist to at least test Hypotheses 4 and 5 of the predictive model.

Until such a time that a reliable predictive model can be constructed, all areas to be affected by industrial development on other terrain altering activities should be preceded by a thorough field survey. Any archeological resources that can be identified should be investigated thoroughly and systemically at least until such time that investigations become redundant. Inventory studies on the shallow coal bearing areas should be tempered with inventories of all ecological zones and with excavations at key sites. Archeological studies should be coordinated closely with studies of geology, soils, vegetation, wildlife and other related projects in the area. All research should be reviewed periodically by concerned agencies and research designs altered as the body of archeological data from the area grows.

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